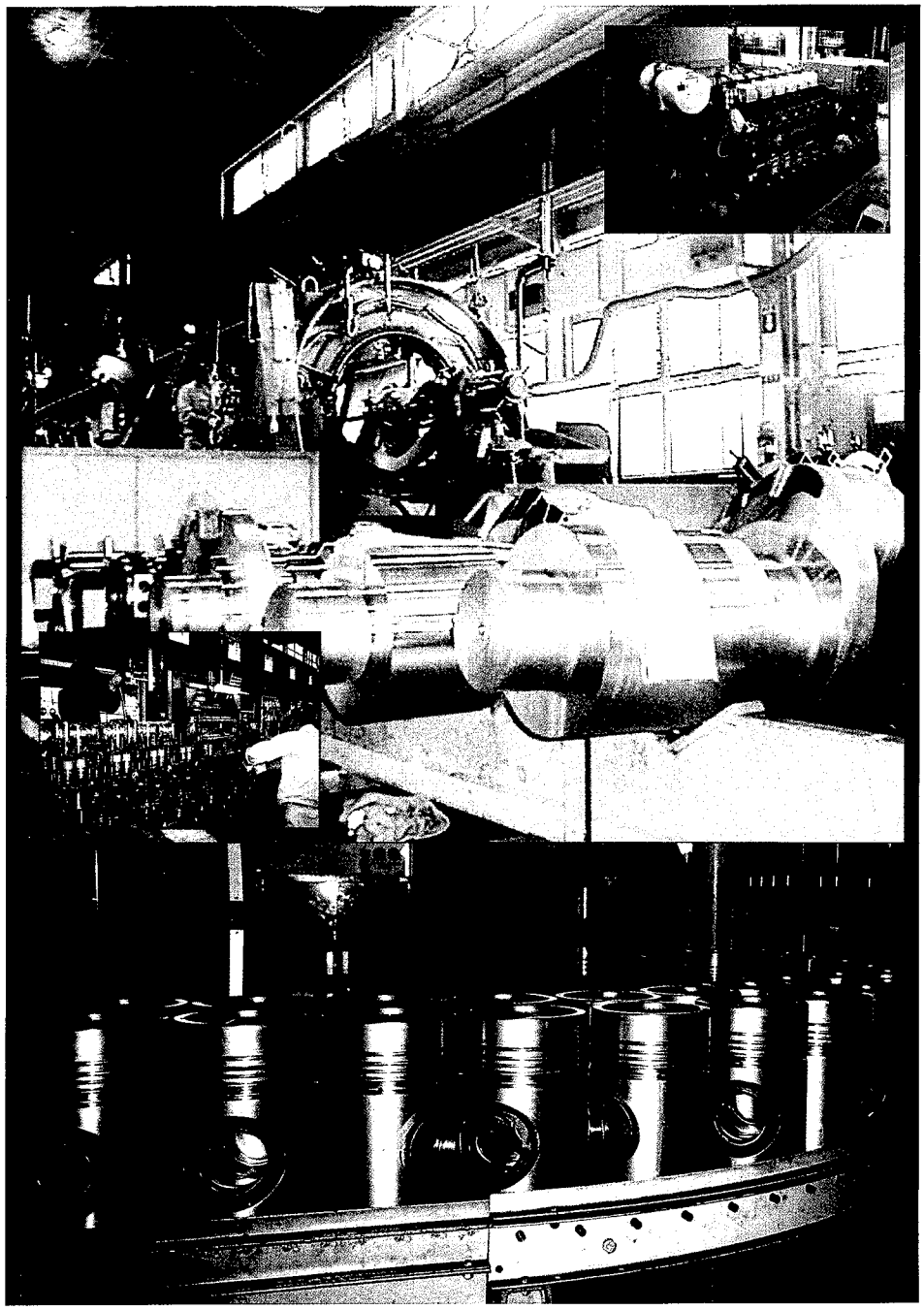
ISSN 0916-7978

PB99-177685

NEW TECHNOLOGY JAPAN

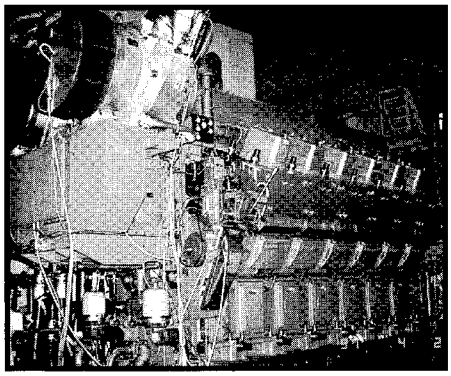
Vol. 25 No.10 January, 1998



JETRO

NEW TECHNOLOGY JAPAN VOL.25 NO. 10

The aim of our magazine is to promote the international exchange of technology through the introduction of Japanese New Technology.



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Cover Photo: Advanced Diesel Engine Manufacturing Plant -Moriyama Factory of Daihatsu Diesel Mfg. Co., Ltd.-(Story on Pages 2-5)

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KEIRIN 00 本印刷物は，日本自転車振興会から，競輪収益の一部である機械工業振興資金の援助を受けて作成したものである。

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INNOVATIVE PRODUCTION NOW

This section describes a specialized section or whole process of a representative factory which excels in specific aspects of production.

Advanced Diesel Engine Manufacturing Plant - Moriyama Factory of Daihatsu Diesel Mfg. Co., Ltd. -

1. Introduction

The medium speed diesel engine has a major role in the marine field such as ship propulsion and auxiliary engines for ship power generation, and for land use such as utility and non-utility power generation, and water & waste water pumping stations, etc. with availability of various fuels such as C-grade heavy oils, and long life cycles with cost effectiveness other than gas oil, etc.

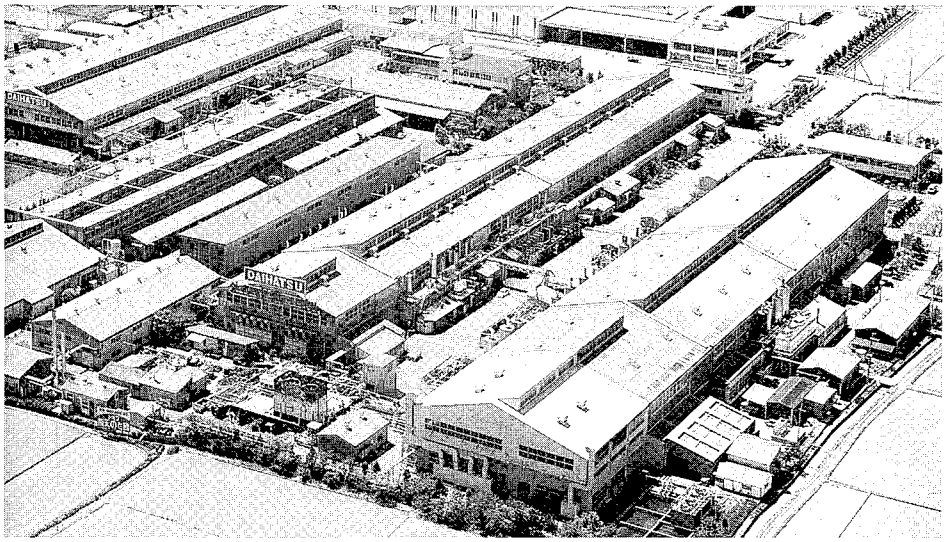
However, the requirements for more and more cost reduction in operation & maintenance, and reduction of NOx emissions are expected by users and required for the environmental preservation.

Therefore, Daihatsu Diesel Mfg. Co., Ltd., which has about 90 years of history in production of diesel engines since 1906 and about 30 years history as the present company, has developed the DK series diesel engines both for marine and land uses in 1993. This was developed under the R&D concept with five stages targeted as 1) reliability & durability, 2) reduced maintenance costs, 3) environmental protection, 4) compactness, and 5) efficiency.

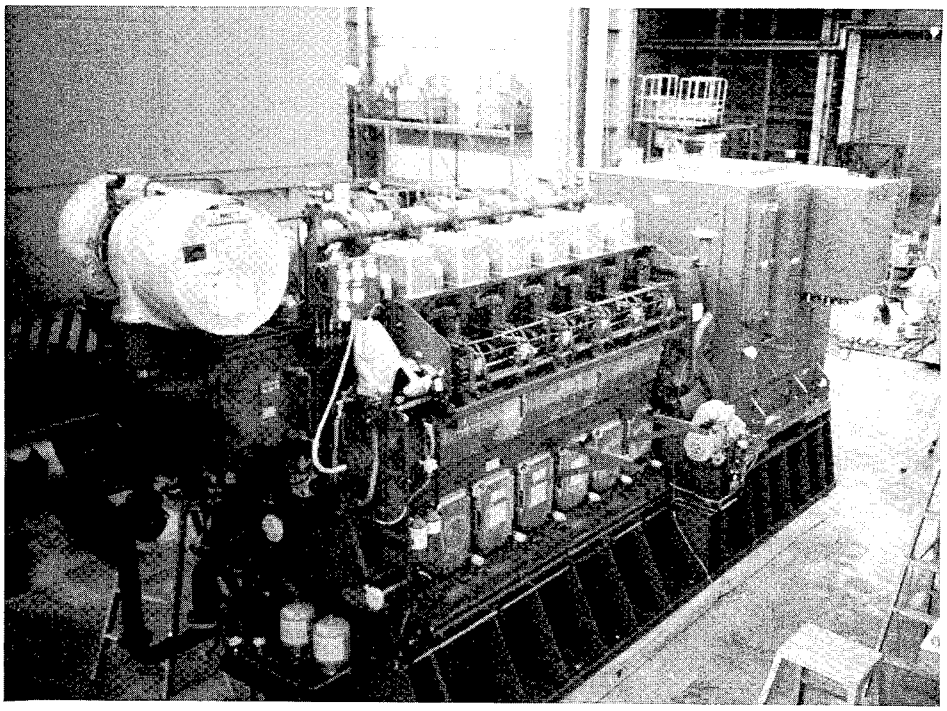
R&D was carried out by 1) FEM analysis for components, 2) performance simulation, 3) standard design method, 4) field experience of former engines, 5) component designs, 6) production of single cylinder research engine, 7) stress measurement of main components, 8) endurance test for main components, 9) production of prototype test engine, 10) endurance tests, 11) total performance test, 12,) mass production design including machining & combination of each parts in all stages.

Production and maintenance measures were also provided in the R&D stages.

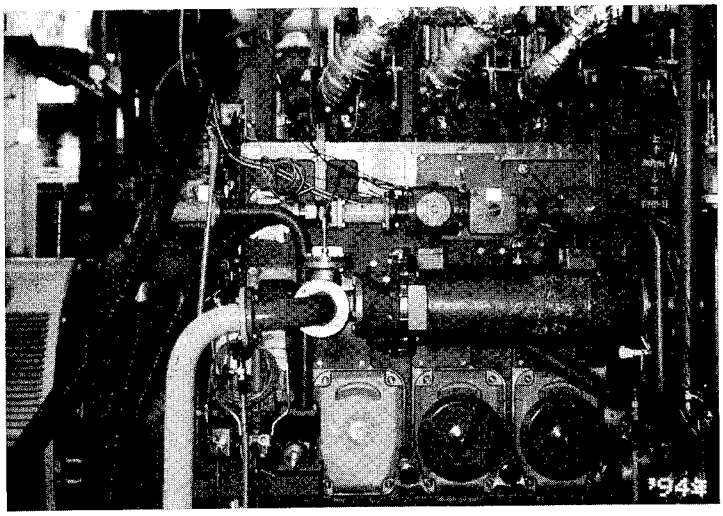
As a result, the DK-28 diesel engines were awarded the 1996 MITI (Ministry of International Trade and Industry) Excel-



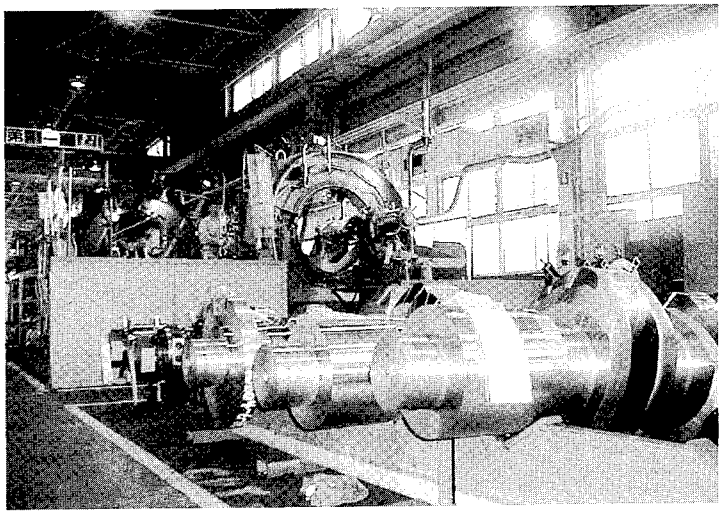
View of the Moriyama Factory of Daihatsu Diesel Mfg. Co., Ltd.



6DK-28 diesel engine prepared for shipment



Unique 3DK-20 diesel engine under test operation



Crankshaft machining operation

lence Energy Saving Equipment Prize based on the development of low NOx emissions and low specific fuel consumption diesel engines with single exhaust pipe turbocharger systems, higher injection pressure and increased compression ratio. NOx emissions of the DK series diesel engines have already cleared the IMO (International Maritime Organization) regulations starting from the year 2000.

The company started sales activities and production of DK series diesel engines from 1993, and the series has become the company's main products for several years.

At present, DK-series diesel engines are classified by bore diameter.

1) DK-20 series with engine speed of 720 and 750 rpm for 5-cylinder (748 HP or 550 kW), 6-cylinder (1050 HP or 773 kW), 8-cylinder (1,387 HP or 1,020 kW), and unique 3-cylinder type are now under testing, and 900 rpm 5-cylinder (897 HP or 660 kW), 6 cylinder for (1,300 HP or 956 kW), and 8 cylinder (1,740 kW).
2) DK-26 series with 720 and 750 rpm for 6-cylinder (2,200 HP or 1,1618 kW).
3) DK-28 series with 720 and 750 rpm for 6-cylinder (2,580 HP or 1,898 kW) and 8-cylinder (3,350 HP or 2,465 kW).
4) DK-36 series with 600 rpm for 6 cylinder (4,500 HP or 3,310 kW), 8-cylinder (6,000 HP or 4,415 kW), and 12-cylinder (9,000 HP or 6,620 kW).

In this issue, the Moriyama Factory of Daihatsu Diesel Mfg. Co., Ltd. is described, producing DK series diesel engines including other types of diesel engines, gas turbines, and automotive aluminum wheels, etc.

2. Moriyama Factory

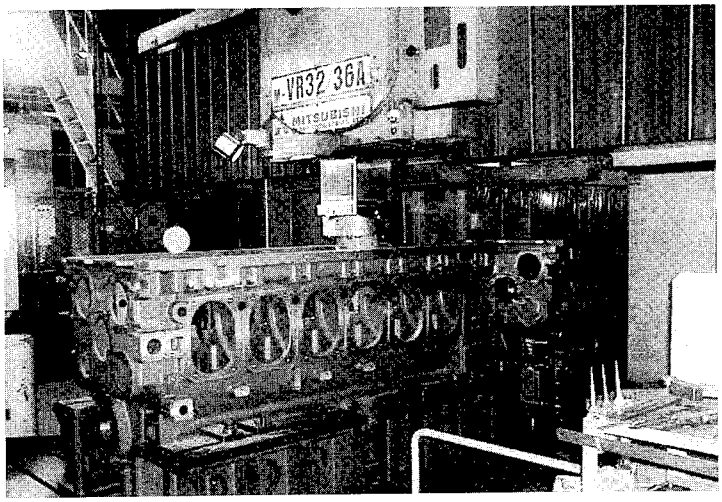
The Moriyama Factory consists of No.1 plant for production of diesel engines and No.2 plant for engine part heat treatment, connecting rod machining, and production of automotive aluminium wheels, products warehouses, and the company's own training centers.

The plant is located at the Moriyama City, Shiga Pref. near by Kyoto, and takes 2 hours 30 minutes by Tokaido Shinkansen from Tokyo to Kyoto, and about 25 minutes from Kyoto to Moriyama JR stations, and 10 minutes by taxi.

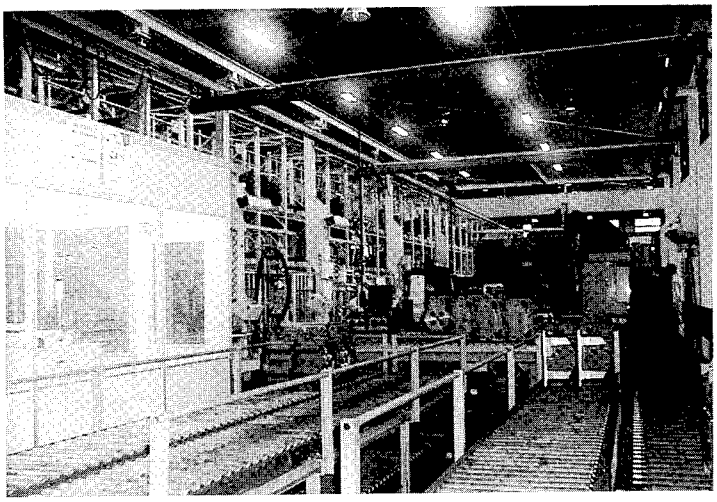
(1) No.1 Plant

The No.1 plant has a site of 95,014 m^2, and 42,301 m^2 of buildings, and 474 staff. There are the No.1 machining shops for crankshaft, engine frame machining, No.2 machining shops for machining small and medium size parts, piston, and cylinder heads, and pre-assembly place for top frame parts, No.1 assembly shops for small and medium size diesel engines and test operation place, No.2 shops for assembly and test operation of large size diesel engines, three offices, and waste water treatment and recycling facilities.

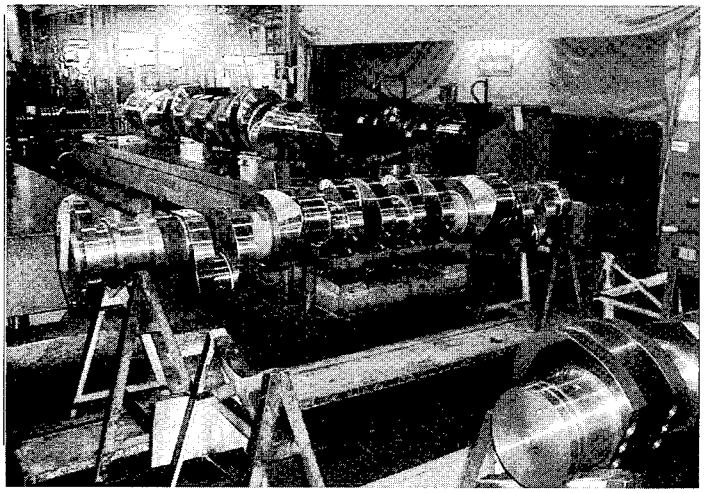
Estimation of the production capacity of the plant is difficult, but production at the plant has already built a total of 506 units, 404 units for marine use and 102 units for land use including 126 units of DK series



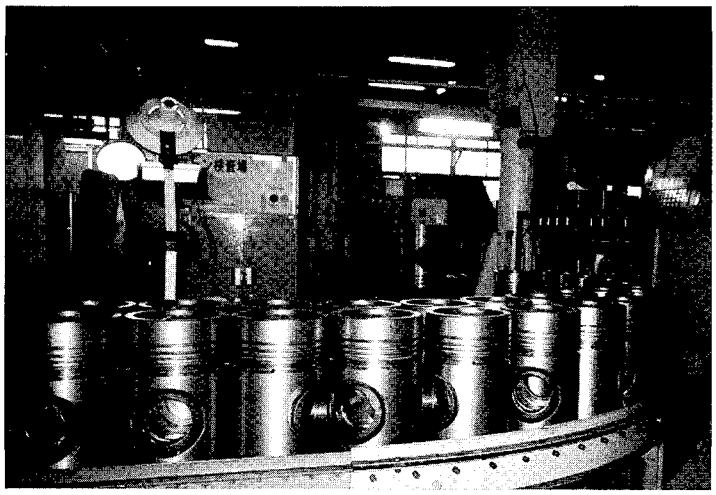
Engine frame machining



FMS line



Finishing inspection



Piston machining line

engines in FY 1994, 505 units, 389 units for marine and 116 units for land including 166 units of DK series in FY 1995, 588 units, for 472 units for marine and 116 units for land included 241 DK series in FY 1996, and 671 units already produced or under production, 537 units for marine and 134 for land include 374 DK series in FY 1997, which will ended march 1998.

So, production capacity is estimate a about 650- 700 units per year.

1) Production

The production of diesel engines at the plant is based on the orders from clients, so producing diesel engines with various types of specifications with small lots.

The large components such as semi-finished crankshafts, engine frames, etc. are procured from subcontracting firms, and small parts are manufactured at the plant.

At the No.1 machining shop, finishing machining for crankshafts and engine frames uses special purpose machine tools including lathes, etc., and machining flow is achieved by straight systems.

At the No.2 machining shop, small part machining, piston machining, and cylinder head machining are operated using various advanced systems. For example, the FMS (flexible manufacturing system) is adopted for small part machining with 24-hour operation systems, and FMC (flexible machining cell) and several machining centers are also installed for various machinings. Machining of piston and cylinder heads uses special purpose machine tools. In this shop, pre-assembly for parts of engines such as cylinder heads, etc. are conducted.

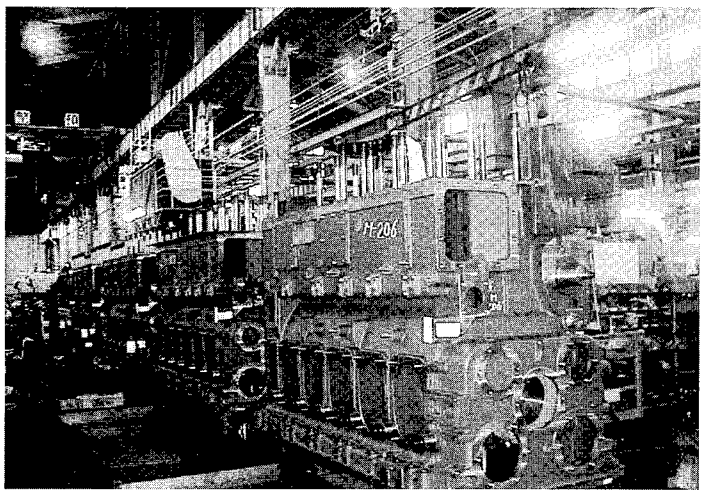
The No.1 assembly shop is for assembly of small and medium size diesel engines with low speed line systems, and completed diesel engines with installation of generators and/or pumps are tested at the trial test shop provided in the center of the line in the shop. This also conducts the tests for gas turbine engines and unique 3-cylinder diesel engines. Usually noise during full load operation of diesel engines is large, so many noise prevention measures are provided such as curtains between the assembly line and noise absorption materials under the ceilings of the shops. Accordingly, noise is not so large.

Production methods in the No.2 assembly shop for large diesel engines adopt stationary assembly systems, but using it is the rail carrier systems. Except for this, the same as the No.1 assembly shop.

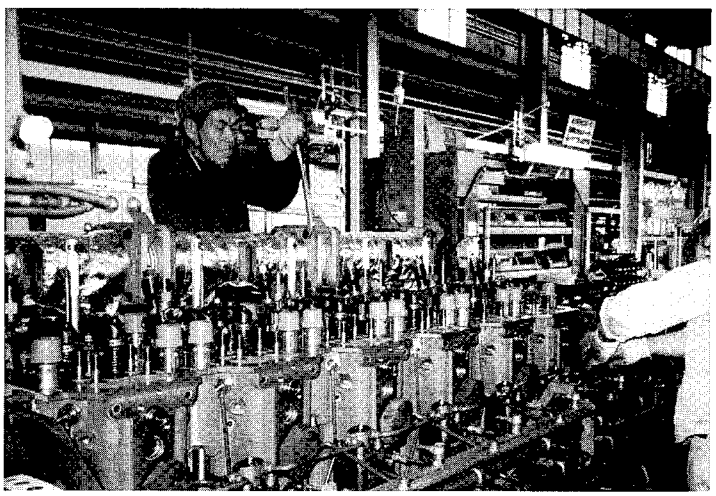
3) Working Environmental Prevention Measures

To maintain good working conditions, each shop has already provided air conditioning systems using the steam boilers and heat pump systems, and cutting dust or waste collection, transfer and storage systems by pneumatic systems. Finally collected waste is stored in hopper bins installed outside of the shops.

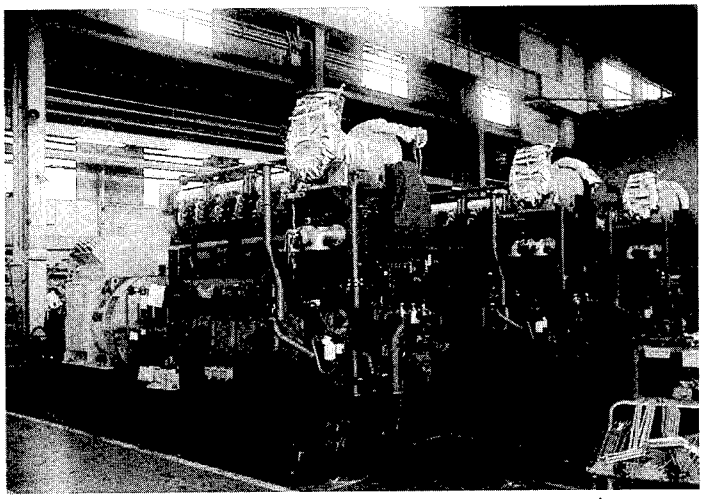
The working conditions for workers are maintained in excellent states.



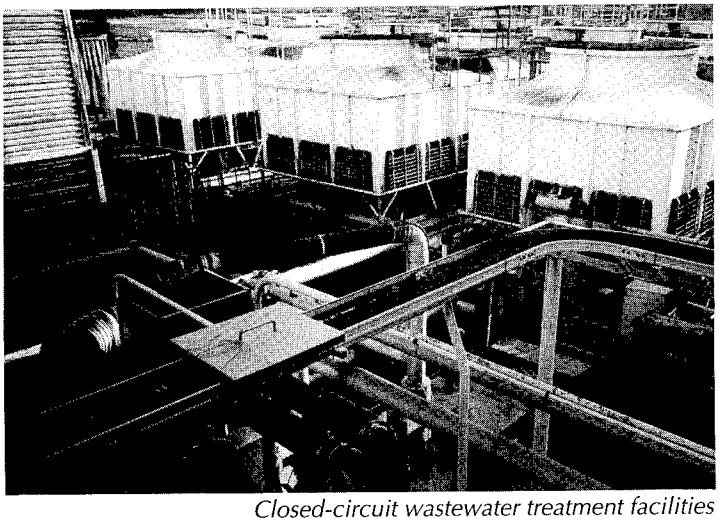
Diesel engine assembly line



Assembly of top part of diesel engines



Completed diesel engines under test operation at testing shops



Closed-circuit wastewater treatment facilities

4) Environmental Preservation Measures

Environmentally hazardous wastes generated at the factory in wastewater include chemicals used in cutting waste oils and cleaning of the parts and others, and coating waste water, etc.

The factory is sited near Lake Biwa, the largest lake in Japan and a famous leisure and sight-seeing place, and surrounded by rice land. Accordingly, the wastewater discharge is severely controlled by the local government.

Therefore, the factory has installed closed-type wastewater systems in which any wastewater is collected in wastewater ponds made of thick concrete, and treated with addition of chemicals, and treated clean water is also recycled into the process.

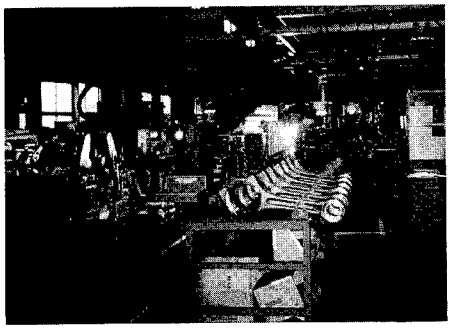
Thus, very strict wastewater management is conducted at the factory.

(2) No.2 Plant

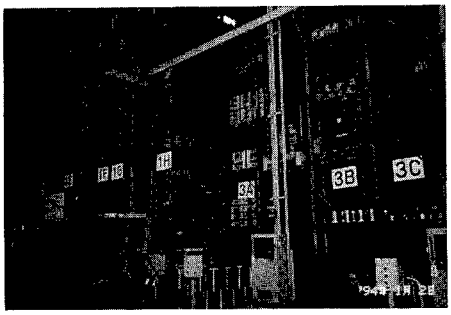
The No.2 plant has a site of 56,161 m^2, and 15,422 m^2 of buildings, and total of 147 staff. The buildings hold the office and staff food service shop, the training center, and agitating shops, diecasting shops, microcomputer assembly shops, and automotive aluminum wheel manufacturing shops, an R&D experiment shop, and a parts center equipped with automatic horizontal type rack warehouse systems operated and controlled by computer systems, where vast volumes of very old to newest parts are stored to cope with emergency requirements from users with 24-hour operation systems.

(3) Training Center

The training center is the company's showpiece facility which is equipped with transparent plastic covered visual diesel engines and half-cut engine models, and displays various components and parts from old to newest types to cope with any training requirements. The visual diesel engine is an operating systems, and the half-cut engine is driven by a motor. The center provides the maintenance training practices to ordinary technicians and high grade specialists, and also newcomer training for Japanese and foreigners.



Connecting-rod cutting , rebolting and machining shop (Moriyama Factory-No.2)



Automated warehousing systems for parts center (Moriyama Factory-No.2)

The Moriyama Factory has already acquired the ISO 9001 certifications in January 1994, and is now preparing for acquisition of the ISO 14000 series certifications.

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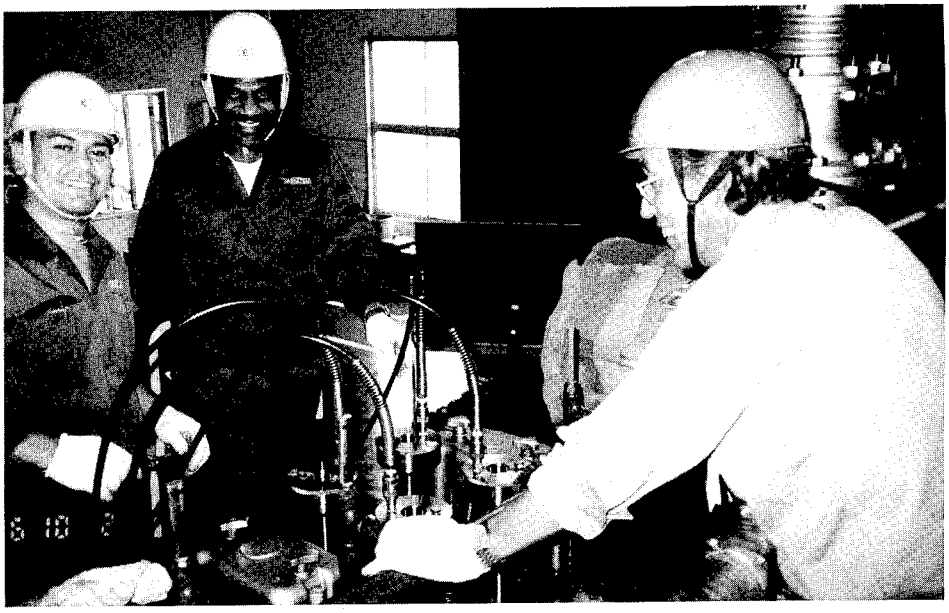


Foreign trainees at the Training Center

TOPICS

This section describes selected developments of special importance or interest due to the achievement of a breakthrough or innovation in technology.

Intelligent Transport Systems Testing/Evaluation Facility Commissioned Into Service

Matsushita Communications Industrial Co., Ltd. has commissioned into service at its Hanamaki Plant (Iwate Prefecture) a course for testing and evaluating various systems and facilities ancillary to intelligent transport systems (ITSs).

The test items are the general communications evaluation of traffic situations (evaluation of the influences of surrounding structures and vehicles), environmental evaluation (evaluation of the influences of snowfall, road freezing, etc.), general evaluation of traffic situations at toll booths (electronic toll collection (ETC) vehicles, non-ETC vehicles, mixture of passenger cars, large vehicles and motorcycles), and adminstration and evaluation of toll collection booth clerical operations (administration and transmission of negative lists, sales data, etc.).

This testing/evaluation facility is usable for testing and evaluating the performances of toll charging facilities and ancillary road facilities which are used by electronic toll collection (ETC) systems, also for the field testing of various intelligent transport systems-related systems and facilities including traffic infrastructures and vehicle-mounted equipment, and therefore contributes to intelligence improvement of traffic systems and vehicles. The course extends over a distance of about 1,000 m, and is a genuine test course of the country's largest scale commercialized by a domestic electrical equipment and communications systems manufacturer.

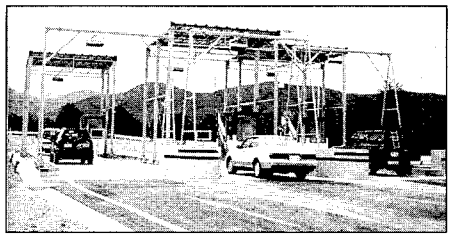
Table 1. Description of Test Course

Location:	92-4, Ohata Ninth Region, Hanamaki City,
	Iwate Prefecture
	(Compounds of Hanamaki Factory,
	Matsushita Communications Industrial Co., Ltd.)
Compound area:	3.75 ha (250 m × 150 m)
Total course length:	About 1,000 m (including peripheral course, S-curves,
	straight roads and intersections)
Peripheral course length:	600 m approx. (straight road about 150 m,
	curves about 7% of bank)
Number of lanes:	Two lanes
Toll collection booths:	3 booths (at municipal expressway inlet, at outlet and
	inside the municipal expressway), mobile booth and gantry
Target vehicles:	Passenger cars, large vehicles (trucks, buses, trailers)
	and motorcycles
Initial capital investment:	¥300 million (for course, ETC booths,
	testing building, etc.
Future investment plan:	Additional ¥1billion

1. Description of Principal Testing Facilities

Electronic Toll Collection (ETC) System

This system is designed for automatic non-stop toll collection to prevent traffic congestion at toll booths. A bothway intervehicular communications system using 5.8-GHz band microwaves permits utilization of antennas installed at the upper parts of lanes for the registration of vehicles at their starting points and to read out destination points, by which toll charges are computed instantaneously to minimize toll collection time loss.



View of system testing for ETC at the new facilities

2. Future Experimental System

Safe Running Support (AHS) System

Various types of vehicle-mounted and road-installed sensors support safe vehicle running by providing various information acquired through intervehicular and course-vehicular communications to enable control of running direction, speed and intervehicular distance as well as to evade hazards.

Experiment Items

*Evaluation of continuous course-vehicular communications.
*Evaluation of intervehicular communications.
*Evaluation of road obstacle sensors (fallen cargo, disabled vehicles, snowfall, freezing, etc.).
*Evaluation of vehicle behaviors (through white line sensing, magnetic nail sensing, etc.).
*Evaluation of sensing of preceding vehicles.

3. Experiment to Develop Existing Systems

Collision Sensing System

Images caught with closed-circuit TV cameras are processed with a computer to compute the speeds of passing vehicles as well as the space occupied, as well as to sense problems and stopped vehicles to supply information to following vehicles to prevent secondary accidents.

System for Controlling Special Types of Vehicles

Special types of vehicles are checked for correct operation, passing through routes in conformance with time schedules requested beforehand, and conformance to applied conditions such as vehicle weight, length, width and height.

Obstacle Sensing System

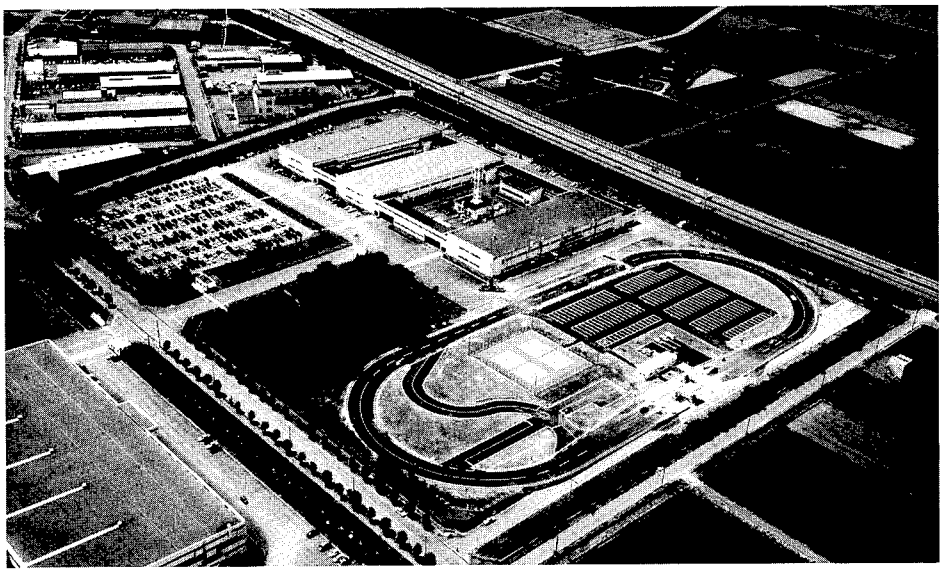
The sensing system is mounted on vehicles to detect obstacles with a millimeter wave radar or a laser sensor to provide data enabling safe running.

Commercial Vehicle Operation (CVO) Control System

Signposts installed in various spots are used to collect and supply information relating to the operation of trucks and sightseeing buses in real time to enable business enterprises to utilize these traffic data to support and improve the efficiencies of vehicle operational control systems.

Bus Operational Control System

Services to passengers are improved by displaying the estimated time of arrival of buses at bus stops with signposts installed along bus routes, based on the time these buses pass through preceding bus stops.



Intelligent transport systems testing / evaluation facility (Hanamaki course)

Vehicle Recognition (AVI) Sensor

Closed-circuit TV cameras are used to photograph and analyze images of vehicles and to read out their number plates. These data have various applications such as calculating the necessary travel time, the vehicle convergence and dispersion ratios, traffic volumes and large vehicle involvement.

Optical Vehicle Sensor

Vehicles are sensed by infrared ray reflection, or optical beacons are used for communications between vehicles running on the same courses.

Imaging Type Vehicle Sensor

The images of running vehicles are captured with a closed-circuit TV camera system and the images processed to acquire traffic information in connection with the number of vehicles passing, speeds, vehicle types, etc.

Optical/Radio Beacon

Infrared rays or microwaves are used to supply information to drivers in connection with traffic congestion and accidents.

Road Freeze Information Sensor

The condition of road freezing is sensed with ultrasonic wave sensors to supply drivers with pertinent information to prevent slippage and other accidents.

The Intelligent Transport System (ITS) utilizes the most advanced data communications technologies to establish a system integrating man, road and vehicle, sophisticating navigation systems, establishing efficient automatic toll collection systems, supporting safe driving, optimizing traffic control and improving the efficiency of road administration.

ITS supplies the information necessary for safe, pleasant and efficient mobility to drivers in real time, accurately and in easily understandable terms, and enables automation of driving operations through the application of information processing and control technologies. As a result, it permits advanced road utilization, lessens the burdens on drivers, expedites pedestrian crossings, makes road traffic safer, improves transportation efficiency and improves road traffic pleasantness considerably. In addition, environmental preservation is promoted substantially through smooth traffic with less congestion, and therefore conduces to the establishment of a lifestyle that is much more pleasant, opulent and efficient.

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NATIONAL R&D PROJECTS

This section describes various R&D projects being carried out in Japan on a national scale.

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The Eco-Energy City Project

~ Energy Saving Technology as a System ~

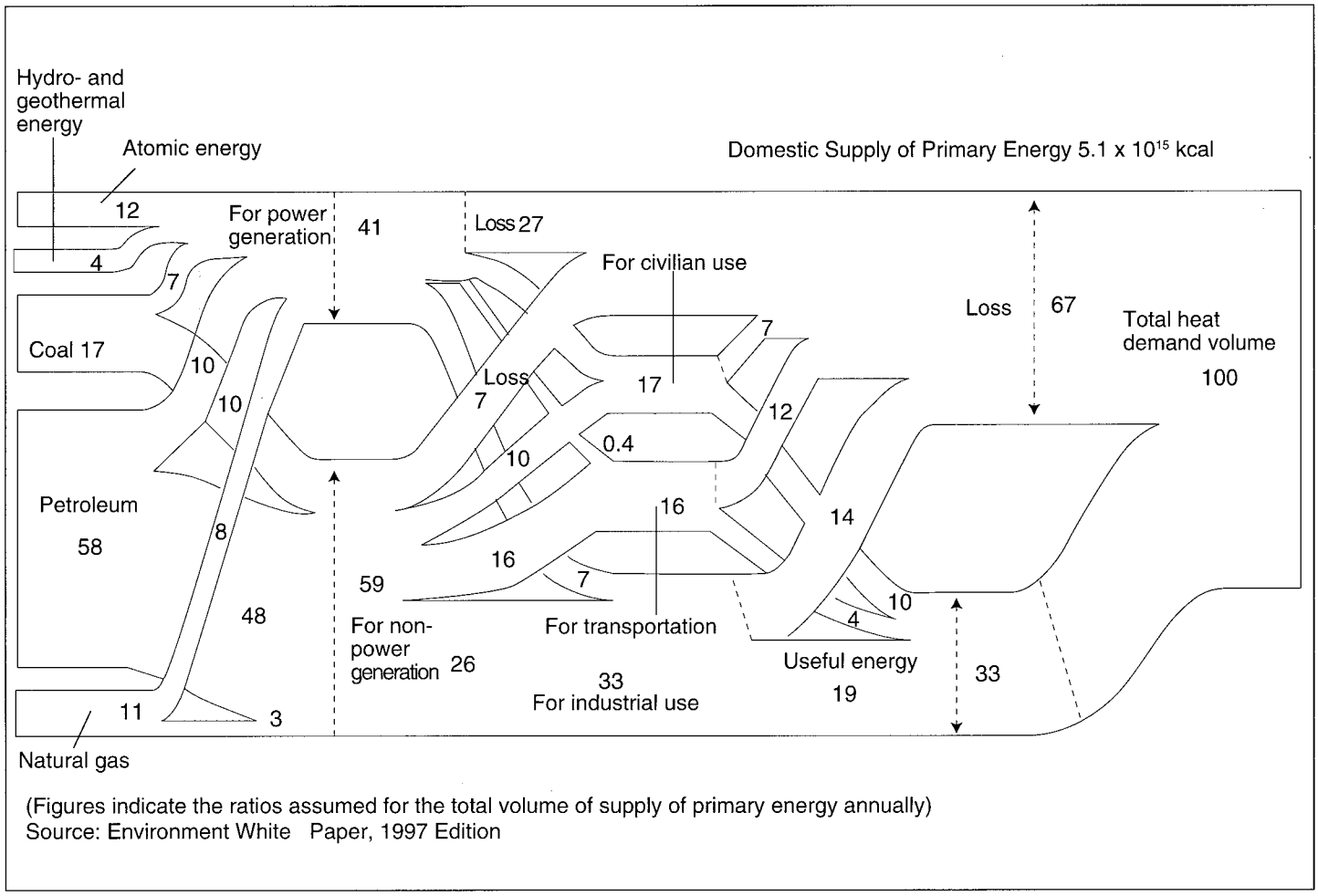


Fig. 1. Flowsheet of Energy Supply and Consumption in Japan (1994)

What is the Eco-Energy City Project?

Japan has faced an oil crisis on two occasions, which required the government as well as citizens in general to endorse rigid energy conservation measures, so that today, the energy efficiency of Japanese industrial plants and individual machinery systems and equipment is recognized as on the world's highest level. Nevertheless, as shown in Fig. 1, only 33% of the primary energy input is utilized effectively, and 67% is dissipated wastefully in the environment in the form of waste heat. Effective utilization of this waste heat would reduce the input of primary energy resources and achieve considerable energy conservation and reduction of CO^2 emissions.

The Eco-Energy City Project (formal name: Wide-Area Energy Utilization Network System Technology Development Project) is one of the various projects advanced by the New Sunshine Program that is implemented by the Agency of Industrial Science and Technology, Ministry of International Trade and Industry. The project objective is to primarily recover and transport low-temperature waste heat of less than 200 °C that is now dissipated into the surrounding environments by power stations and industrial plants, and to enable the collected heat to be utilized effectively by urban regions for low-temperature heat demands. Technically, as a system, the project aim is to develop energy conservation technologies.

Contents of Research and Development

The Eco-Energy City Project has an R&D period of eight years from FY 1993 until FY 2001. The project can be classified broadly into the stage of development of basic technologies and the stage of study of city energy systems to be applied in combination with these basic technologies. In the initial plan, the target of technical development had been placed primarily on the long-distance transportation of heat (30 km), so the construction of a 1-MW pilot plant had been assumed, but the plan was reassessed in March 1996 and the project was reaffirmed as an integrated project primarily to establish a wide range of basic technologies, and the construction of the pilot plant was terminated.

The basic technologies were consolidated into the following technical classifications, and research is presently being advanced in connection with 13 themes.

Classification

1) Technology to recover untapped energy resources such as waste heat effectively for conversion into specific uses.
2) Technology to transport and store recovered and transformed energy resources efficiently.
3) Technology to supply and utilize energy effectively in conformance with city energy demands.
4) Technology to decrease the emission of substances exerting a burden on the environment through energy utilization.
5) Peripheral basic technologies such as instrumentation technologies.
6) Control and evaluation technologies for the establishment of energy network systems

The interim evaluation of the projects, carried out during FY 1996, found that the development of basic technologies was generally proceeding smoothly and steadily. In the research study of city energy systems, the range of application of the basic technologies/systems is coordinated on a time axis and a space axis to estimate the quantitative induction effect and economy and, at the same time, surveying typical examples of heat waste and heat demand as well as the regional heat supply patterns on a national scale.

Heat Transportation Technology Using Methanol

Technology to transport energy resources effectively is under development, among the various basic technologies, to specifically use methanol reaction to transport energy resources effectively, as well as technology that utilizes hydrogen occlusion alloys. Both technologies have the potential to transport waste heat of a temperature level that usually would be difficult to transport efficiently with existing technologies. The technology to transport heat by utilizing the following decomposition and synthesis reaction of methanol is described here.

(1)

CH_3OH (methanol) + 95.0 kJ
< > CO (carbon monoxide) + 2 H_2 (hydrogen)

(> : Decomposition reaction with recovered heat, and
< : heat supply with synthesis reaction)

With this heat transportation technology, waste heat of 150-200 °C available in industrial regions is recovered by utilizing the endothermic decomposition reaction of methanol and transported to urban heat demand regions through pipelines as the generated carbon monoxide and hydrogen. In the heat demand regions, the heat is supplied by the exothermic synthesis reaction of carbon monoxide and hydrogen, and the reformed methanol transported to industrial regions by recirculation. The basis of this technology is the efficiencies of heat conversion into chemical energy and heat extraction by exothermal reaction. The establishment of technologies to produce catalysts is a vital requirement.

In reaction (1), methyl formate is used as an intermediate substance and a two-stage reaction performed, by which heat of lower temperature than that based on the reaction (2) for low-temperature heat conversion can be recovered, and it will also be possible to supply heat at higher temperature than the heat obtained through reaction (3) for high-temperature heat conversion.

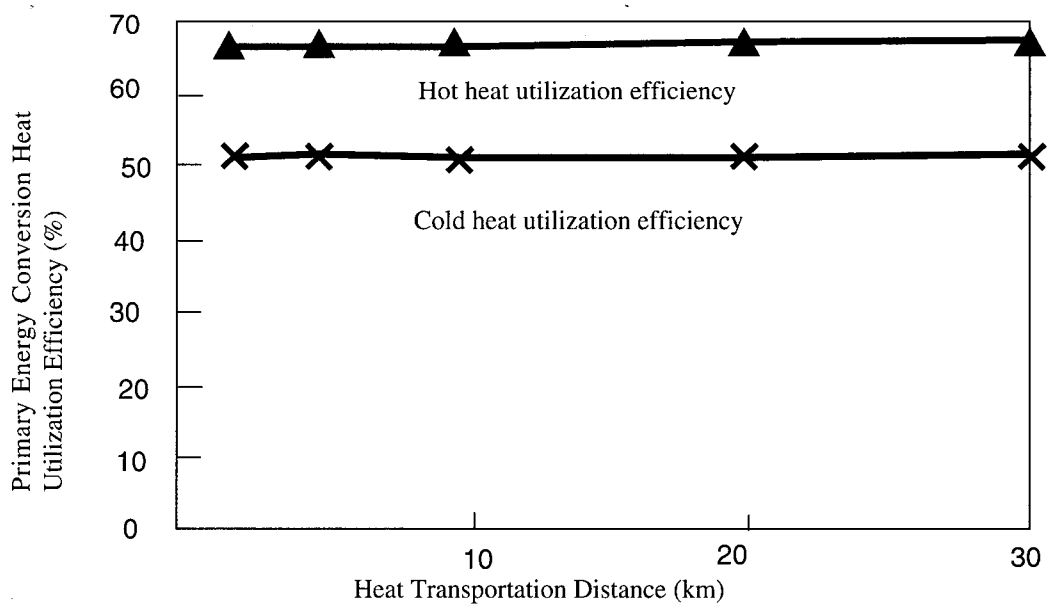
$HCOOCH_3$ (methyl formate) + 38.0 kJ

$$\xleftarrow{\quad} CH_3OH + CO \qquad (2)$$

$$2CH_3OH + 62.6\ kJ \xleftarrow{\quad} HCOOCH_3 + 2H_2 \qquad (3)$$

Heat transportation technology utilizing this two-stage reaction achieves the primary energy conversion heat efficiency (at time of ultimate target attainment) shown in Fig. 2, and the unit thermal cost based on the system installation cost and civil engineering cost as in Fig. 3.

The thermal efficiency will be constant regardless of the transportation distance, but the unit heat cost will be greater with a longer transportation distance. Considering that the unit heat generation cost of existing regional air conditioning plants is ¥20-30/Mcal, that of the heat transportation system will be doubly higher, so the future themes for research and development will consist of cost cause analysis to feed back the results to technology establishment.



Notes:
1) A system is assumed that recovers waste heat of 200 °C and supplies hot heat of 80 °C and cold heat of 7 °C.
2) Hot heat utilization efficiency = (Usable output)
(Waste heat input + auxiliary input heat + auxiliary energy)
Cold heat utilization efficiency = Hot heat utilization efficiency x endothermic refrigerator efficiency

Fig. 2. Methanol System Heat Utilization Efficiency

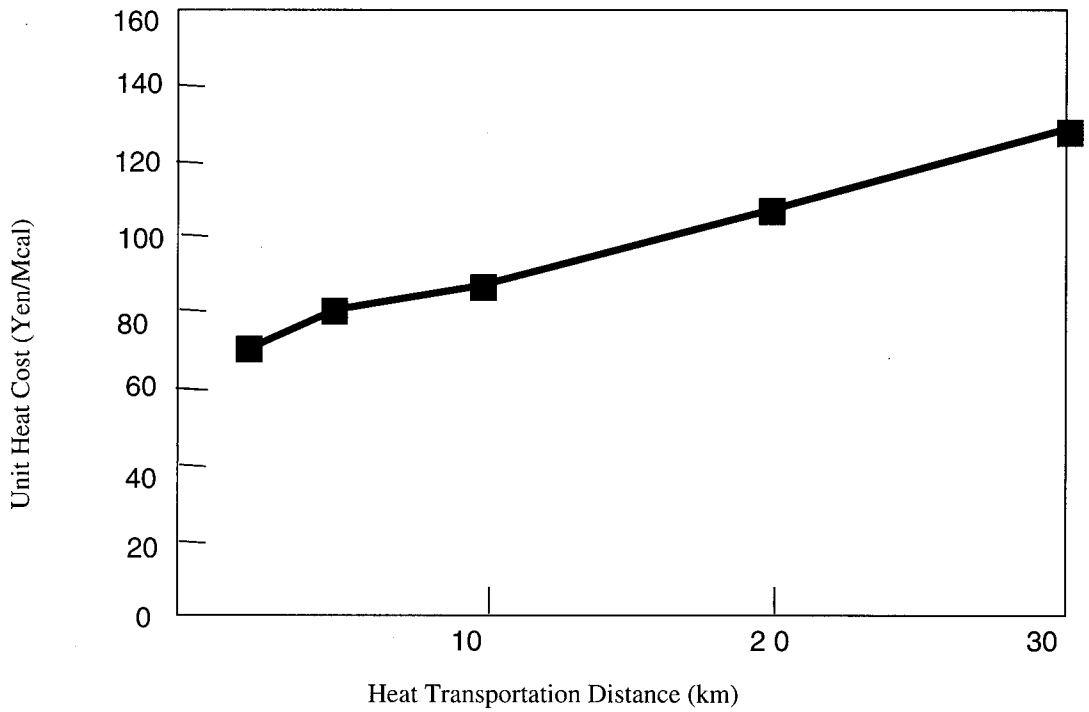


Fig. 3. Unit Heat Cost of Methanol System

GENERIC TECHNOLOGY REVIEW

This section describes various basic research and development activities in Japan to inform the world about generic R&D efforts here.

Technology for Multifunctional Material Processing

Research on New Processing Technique Using Non-Contact Manipulation of Fine Particles

Hybrid Simulation Technology for Designing Mesoscopic Materials

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Technology for Multifunctional Material Processing

National Industrial Research Institute of Nagoya

Objective

Recently, the development of advanced materials has been advanced by developing material characteristics and incorporating the materials with multiple functions, so methods to resolve issues in these lines of development are necessary. One approach is to investigate and study technologies for the fusion of various types of materials.

For materials which are formed by fusing various kinds of materials, a device/material processing technique could be developed that involves electronic devices and silicon semiconductors. A survey will be made of the present state and trends relating to research to develop electronic devices such as ferroelectric thin-film memory chips and devices which integrate silicon semiconductors, to select the future research and development themes relating to ceramic technologies for the commercialization of these devices and assemblies. Also, regarding the structural fusion of inorganic materials, research study will be advanced on techniques to advance the fibers which are vital in the development of long-fiber composite materials. Further, research will be advanced on composite function type surface treatment agents which represent a surface reforming technology that is regarded as indispensable for the fusion of materials.

Contents

The research study project is advanced in connection with the following themes:

1. Development of devices integrating electronic ceramics/silicon semiconductors
   1) Elucidating the future needs of electronic ceramics/silicon semiconductor integrated devices of various industrial sectors.
   2) Investigating the present state and trends of research studies relating to these devices.
   3) Investigating the present state and trends of research studies relating to ceramics technologies relating to these devices (microstructure control technologies in particular).
2. Elucidation of the mechanical characteristics of ceramic fibers at high temperatures
   1) Development of fibers with excellent creep resistance (composite fibers with structures containing nano-sized grains in dispersion).
   2) Evaluation of the mechanical characteristics of fabricated fibers.
3. Development of composite function type surface treatment agent
   1) Research will be advanced to develop and commercialize new types of composite function type surface treatment agents by utilizing the surface transition effect of CF_3 groups (CF_3 groups of molecules are bent and accumulated on the surface by hydrophobicity).

Repercussion Effects

Examples of anticipated applications of the electronic ceramics/silicon semiconductor integrated devices include ferroelectric thin films and memory chips which considerably improve data processing capability in the sectors of information processing and communications, the biocompatible microprocessor for medical treatment in the sector of medical treatment and welfare, the energy conservation electronic device using thermoelectric elements in the energy sector, and smart materials which integrate sensors, actuators and control circuits in the sector of aircraft and aerospace development.

Composite fibers are expected to enable remarkable progress in the sectors of aerospace for fabricating the engines and bodies of space shuttle vehicles, and in the sector of energy development for the development of high-efficiency gas turbines as well as atomic energy and nuclear fusion furnaces. Meanwhile, the development of composite function type surface treatment agents is anticipated to improve the properties of various types of materials through their surface coating. In the sector of treatment of incombustible materials, in particular, the use of conventional types of bromide compounds is becoming increasingly difficult from the aspect of environmental preservation, so there is an urgent need for the development of some safe alternative compounds. For antibacterial surface treatment agents, there is an urgent social demand for the development of new highly safe substances which do not use heavy metals, sterilizers and other undesirable substances.

Research on New Processing Technique Using Non-Contact Manipulation of Fine Particles

National Industrial Research Institute of Nagoya

Raw particles of high purity and great uniformity will be necessary in order to produce high-quality inorganic functional materials, so non-contact methods to apply different force depending on the material characteristics will be required. In this research project, acoustic radiation pressure generated by ultrasound is applied to manipulate particles suspended in a fluid medium without contact so as to establish a new material design, formation and utilization process.

Researc has been conducted to form a domain of high energy level locally by using ultrasound. When ultrasonic waves propagating in a fluid are obstructed by some object, a force is generated that pushed the object in the direction of sound propagation. This force is called acoustic radiation pressure and acts on objects without contact. When particles whose size is much smaller than the ultrasonic wavelength are placed in an ultrasonic standing wave field that is formed by placing a transducer and a reflector in parallel, they are subjected to a force directing from the sound pressure loop to node, and captured and agglomerated in the sound pressure node. By optionally changing the standing waves field, it is possible to establish a non-contact manipulation process for the captured particles.

This research project will try to form an optional acoustic standing wave field. Shapes and arrangement of a transducer and a reflector and control of electric signal to drive the transducer will be examined to form an optional acoustic field. Next, the force acting on the particles in the acoustic field will be evaluated. The objection placed in the acoustic field will be subjected to the force whose strength is different depending on the substance characteristic. So the time difference of particle motion will be used to manipulate and separate these substances according to their specific characteristic.

Specifically, experiments will be conducted to observe and elucidate the behaviors of particles when they are fed into an acoustic field formed with multiple transducers. In addition, the sound pressures distribution in the three-dimensional acoustic field will be measured, while the acoustic field will be visualized by a suitable optical technique to conduct basic experiments to form optional acoustic field. Further, acoustic field calculations will be performed through computerized simulation to evaluate the results of these measurement so in order to establish a position control technique using ultrasound for particle. The establishment of a technique to manipulate fine particles is needed not only in production of inorganic functional materials. but also in remote-controlled actuators for micromachines, and non-contact handling of biological materials. Since irradiation of ultrasound will enhance chemical reactions and surface modification, great expectations are placed on the results of this research project.

Hybrid Simulation Technology for Designing Mesoscopic Materials

National Industrial Research Institute of Nagoya

Ceramic materials feature excellent characteristics such as high-temperature resistance, but also have disadvantages such as great hardness, brittleness and machining difficulty. To overcome these disadvantages, the application of new techniques is being attempted, such as the superplastic deformation process. However, it is as yet unclear how the ceramic properties would change subsequent to a variation in the material composition or structure, so there is no alternative but to attempt to develop new ceramic materials through experience.

With the conventional material development process, optimum materials are selected by repeating the process of identifying the candidates, experimental fabrication, characteristics evaluation and reassessment of candidates, so much time and costs are necessary. If it was possible to substitute part of this developmental process by a computerized simulation technique, the pace of material development would be improved considerably.

The establishment of a computerized simulation technique for ceramic materials is rather backward compared with similar techniques for other compositions such as organic molecules and metallic system. One of the reasons is that the ceramic material is essentially a polycrystalline substance, so that the material characteristic behaviors are quite complicated due to the interactions of the crystal grains and the grain boundary. The grain boundaries inside ceramic materials have a spatial scale equivalent to several atoms, but the size of the grains are from several hundred times to several ten thousand times larger, making it quite difficult to model such mesoscopic structures.

The objective of this research project is to develop a new simulation technique for materials characterized by mesoscopic structures and to investigate the behaviors of the grain boundaries and crystal grains of ceramic materials as a polycrystalline substance. Specifically, based on the molecular dynamic computing technique for polycrystalline substances the research team developed earlier, an attempt is being made to establish a hybrid simulation technology that also involves other computing techniques such as the density functional derivative method, the Monte Carlo method and finite element method. A new simulation technique can be established, for example, to estimate fracture characteristics, trace the process of structural formation, or to estimate the characteristics of composite materials consisting of metals and ceramics. In this research project, the plan is to establish these techniques and to fabricate hardware that is optimized for conducting these calculations.

98-01-100-01

New Selectin Blocker for Mass Production

A joint research team of the New Drug Discovery Research Laboratory of Kanebo Ltd. and Prof. M. Kiso of the Department of Applied Bioorganic Chemistry, Gifu University, have discovered a novel selectin blocker that is promising for use as a medical drug to treat allergies such as atopic dermatitis. The drug blocks the excessive actions of white blood corpuscles which cause allergies, and its effect has been confirmed through animal experiments. A mass production process has also been established and the drug can be supplied on a commercial basis. The research team plans to commercialize the drug within ten years.

Allergies are caused when foreign substances enter into body cells, in which case white blood corpuscles such as neutrophils and lymphocytes which destroy these foreign substances are excessively discharged from the blood vessels and into the tissue. The newly developed drug suppresses the excessive discharge of these white blood corpuscles and suppresses allergies.

In the process of developing the new drug, the research team focussed its attention on a protein called selectin that serves as a switch to control the flow of white blood corpuscles from blood vessels into tissue. Suppressing the actions of this protein was conceived to prevent allergies, so the research team synthesized a saccharide chain that bonds readily with selectin. An attempt was made to create a chemical substance that can be synthesized in large quantity and retains the function of binding with selectin.

As a result, a chemical substance named GSC-150 was developed that consists primarily of lactose and has a molecular weight of about 1,000. When the substance was injected into the veins of a mouse displaying the symptoms of atopic dermatitis, the numerous neutrophils which were present in the dermic cells were decreased considerably and the atopic lesions healed.

This is a glycosylation process using the armed-disarmed method and enables Sulfo-Lex to be synthesized most efficiently. Various glycosylation methods have been devised previously, but this is the first method in which the Sulfo-Lex derivative has been synthesized with a 1-pot reaction in the presence of N-iodosuccinimide (NIS) and trifluoromethane sulfonic acid (TfOH) at a high yield.

Lactosethioglycosyl acceptor-1 is producible with ease in five stages from lactose and fructose thioglycoside donor-2 is reacted with N-iodosuccinimide (NIS) - trifluoromethanesulfonic acid (TfOH) as the promoter. After confirming the completion of reaction, and without reaction treatment and separation/purification, long-chain alkyl alcohol 3 or appropriately protected sugar acceptor 4 is reacted using NIS-TfOH as the condensing agent, by which the target oligosaccharide chain is obtained in the high yield through 1-pot, 2-step glycosylation. Subsequently, sulfation and deprotection of protected groups is conducted selectively, and Sulfo-Lex derivative 5 produced.

This is a versatile method, and the technique can be applied to the synthesis of various types of biologically active oligosaccharides by 1-pot multistep glycosylation.

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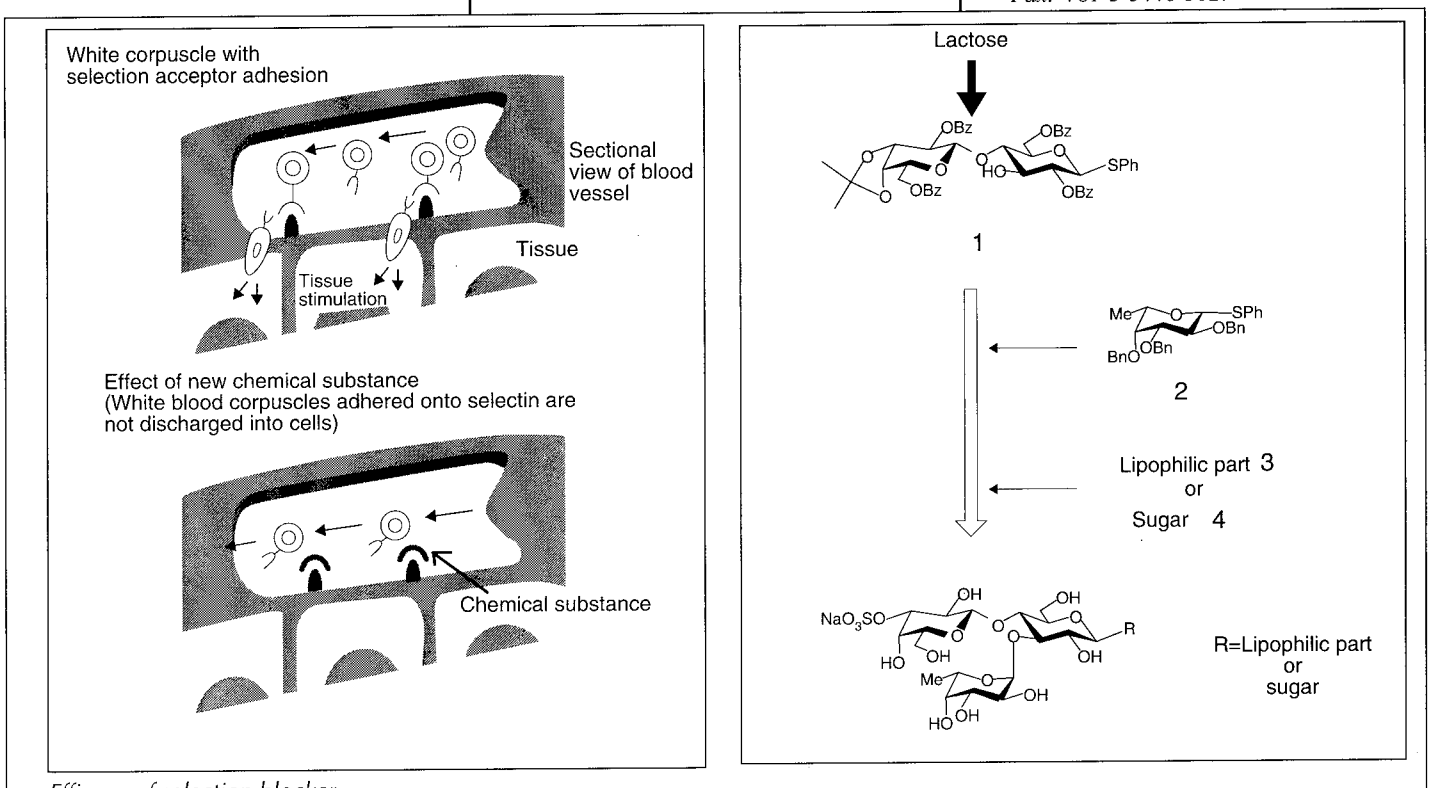

Efficacy of selection blocker

98-01-100-02

Data Processing Board Made of LSI Patterned After Cerebral Meninx

The Electrotechnical Laboratory of the Agency of Industrial Science and Technology has developed an LSI patterned after the cerebral meninx (large-scale integrated circuit) that incorporates the learning function, and by applying this chip has made a prototype data processing board.

The cerebral meninx type LSI (processor) that is central to the data processing board mimics about 1,000 nerve cells and about one million synapses (links between nerve cells) with an electronic circuit. It applies the conventional neural network technique of changing the circuit linkage mode by repeated signal input, while introducing a mechanism not present in the neural network to feature actions which are closer to those of the human brain.

An element in charge of short-term memory storage is provided at each synapse junction point, and when the element equivalent to an independent nerve cell inputs a signal, the synapse junction point investigates and elucidates what kind of signal was received by each cell just prior to signal input, based on which the synapse junction point mode of linkage is changed appropriately. This means that biological organisms are capable of learning the time sequences in which events occur. By incorporating this mechanism, the processor can acquire a function of resolving problems by itself through the trial and error method even without instructions for the procedure.

The data processing board has a height of 10 cm and breadth of 20 cm, mounts two processors, and a memory and input/output unit. Simply linking the board to a versatile type personal computer enables the system to be used as an inferential processing brain for image processing in a manner resembling that of human visual process, and can recognize handwritten characters.

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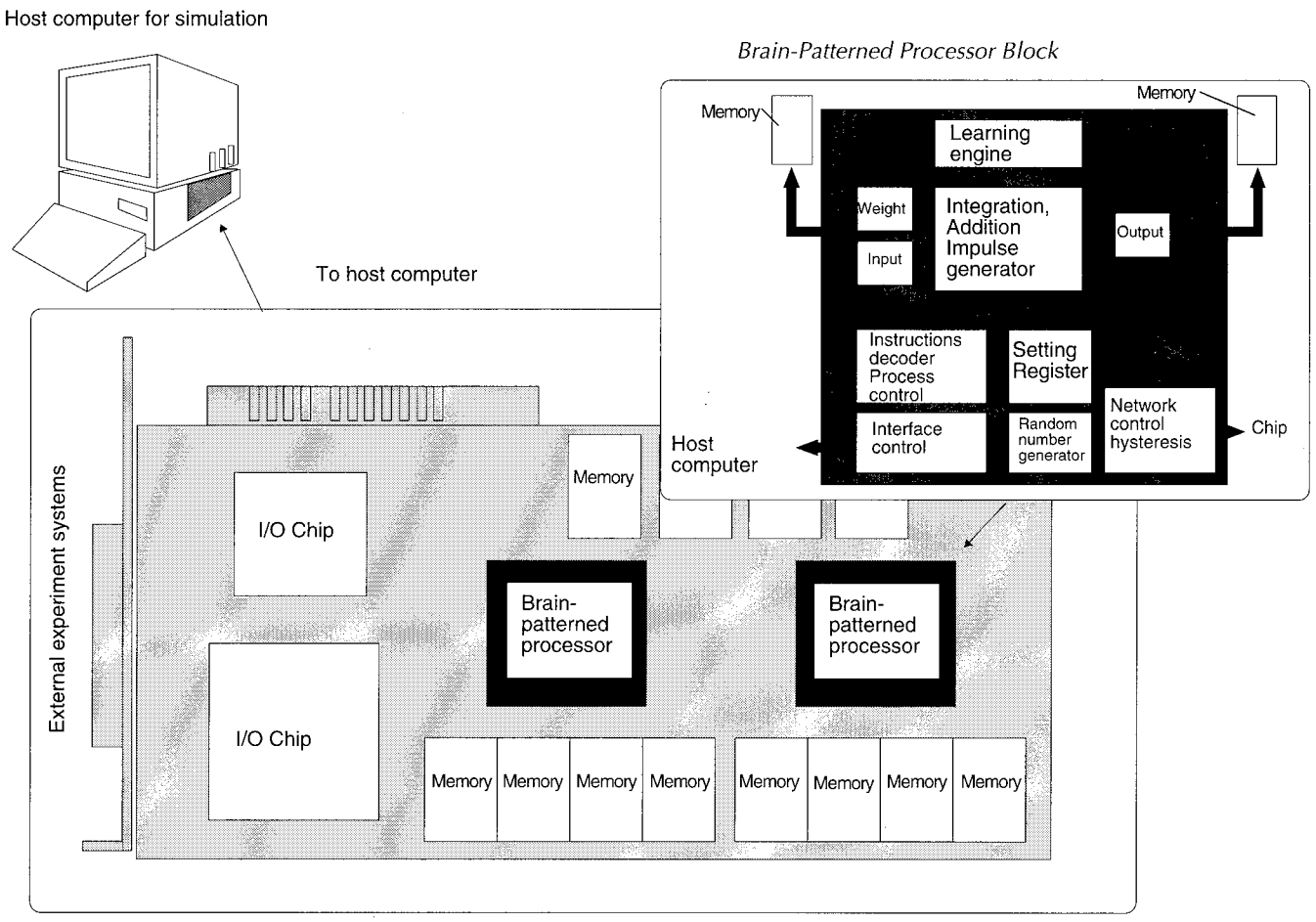

Main Board of Brain-Patterned Processor

98-01-100-03

Gallium Nitride Semiconductor Quantum Dots Formed

Y. Aoyagi and S. Tanaka of the Institute of Physical and Chemical Research (RIKEN) are conducting an atomic scale processing project as a link of an atomic scale sci-engineering program, and have succeeded in estabishing an entirely new technique to form semiconductor quantum dots. The semiconductor quantum dots are anticipated to manifest new physical phenomena different from those displayed by the conventional type of three-dimensional bulk, and are quite interesting not only from the aspect of elucidating the low-dimensional physical properties of substances but is also expected to have applications to shortwave laser diodes at room temperature, which are anticipated to bring about considerable progress in high-performance electronic devices and optical devices.

With the newly established technique, the surface energy of a wafer crystal is controlled artificially to enable the formation of quantum dots in systems where this had been impossible previously, and the dot size and density can be controlled flexibly. For example, gallium nitride (GaN) quantum dots are formed successfully, of which application to the fabrication of shortwave lasers is anticipated. With conventional types of techniques, the formation of GaN on aluminum gallium nitride (AlGaN), which is indispensable for forming device structures (carrier confinement), had been possible only in the form of a thin film (due to the small lattice mismatching and the surface energy balance advantage of film growth), so the formation of dot type structures had been impossible.

Reacting a chemical substance on the wafer surface beforehand was found to be effective for dot growth, which enabled control of the growth mode. Also, by changing the experiment conditions, it was possible to control the size and density of the quantum dots flexibly. In addition, success was achieved for the first time in generating and observing stimulated emission (lasing) from the GaN quantum dots by laser excitation. Compared with a structure using the conventional type of quantum thin film, characteristic values can be considerably decreased.

The new technique is anticipated to permit the formation of quantum dots in systems consisting of gallium arsenide (GaAs) or zinc selenide (ZnSe), which are typical compound semiconductors, as well as the formation of silicon (Si) quantum dots. These materials had been produced previously only in the form of quantum wells and quantum wires, which prevented the formation of quantum dots of natural formation. Therefore, even in connection with these materials, the manifestation of new properties by the quantum dots (low-dimensional systems) raises the possibility of commercializing new types of optical and electronic devices utilizing lasers of higher performances.

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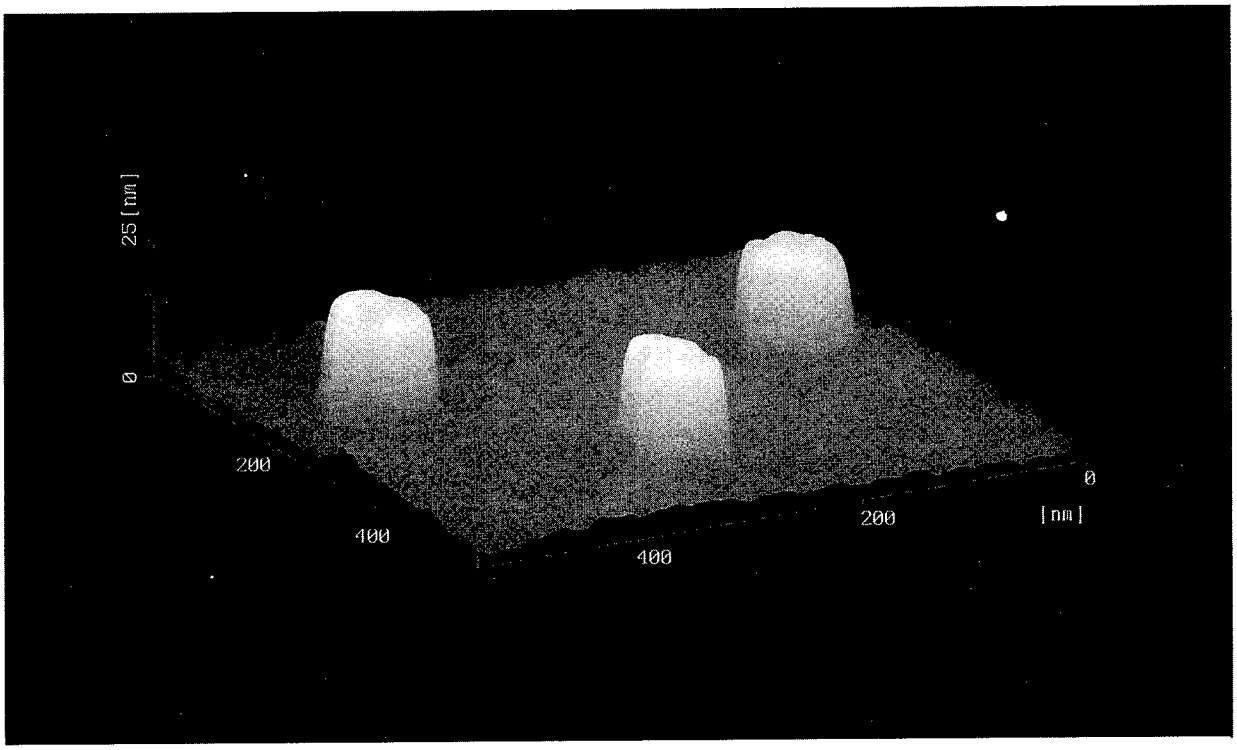

ATM (Atomic force microscope) photograph of GaN quantum dots fabricated by the newly established technique

NEW TECHNOLOGY & PRODUCTS

This section provides information about recently developed technologies and products, divided into Advanced Materials, Electronics & Optics, Information & Communications, Process & Production Engineering, Construction & Transportation, Energy, Environment, and Biotechnology & Medical Science.

Advanced Materials

98-01-001-01
Mass Production of Magnetic Valve Made of New Composite Magnetic Material

Denso Co., Ltd. and Hitachi Metals, Ltd. have jointly developed a composite magnetic material with a ferromagnetic part and a nonferrous part in the same material, and by using this composite material have succeeded in the mass production of a compact magnetic valve. By incorporating a ferromagnetic part and a nonmagnetic part in the same material without soldering, the manufacturing cost has been reduced and the material reliability also improved, and the magnetic valve has been made smaller by about 30% compared with conventional counterparts.

With a magnetic valve, fabricating the entire sleeve structure with a nonmagnetic material increases its magnetic resistance in magnetic path, making it necessary to enlarge the coil. Making a part of the valve magnetic and brazing the magnetic and nonmagnetic parts together will resolve the size issue, but the manufacturing cost will be increased. The companies improved the multistage forming method and heat treatment method to resolve this problem.

Specifically, composite magnetic material was made ferromagnetic by deformation-induced martensite, followed by rapid heating and subsequently quenching of a part of the valve to make the structure nonmagnetic. The essential technical requirements were temperature control and process control methods as well as composition control. Subsequent to various experiments on the multistage forming and other related techniques, the heat treatment temperature was set at about 850° to refine crystal grain size. By using the new composite magnetic material, the magnetic valve outside diameter was decreased from 24 mm to 19 mm, and the entire valve size also reduced substantially.

Denso has already started manufacturing magnetic valves for anti-lock systems (ABS) by using this new material and is presently producing 80,000-100,000 units per month. The equipment ratio of anti-lock braking systems in Japan is about 40% as compared with a high ratio of 70-80% in the United States, so the system is anticipated to be applied widely to engines, diesel engines as well as to automobiles in operation in the country.

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98-01-001-02
Carbon Fiber Reinforced Plastic Eaves Trough with Elongation Comparable to Metal

Toyo Chemical Co., Ltd. has used a new type of carbon fiber reinforced plastic (CFRP) to develop an eaves trough displaying an elongation comparable to that of metal. Normally, a plastic eaves trough is made of vinyl chloride plastic and is therefore lighter, easier to manufacture and less corrosive than those made of metals, but the major setback is substantial elongation and contraction throughout the seasons due to the temperature difference.

The company perceived that carbon fiber displays a negative linear coefficient of expansion and had been engaged in research to commercialize an eaves trough made of carbon fiber, and succeeded in developing an eaves trough displaying a thermal elongation close to that of vinyl chloride steel plates or eaves troughs made of metal.

This new CFRP eaves trough has a double-layered structure, with the core layer made of a new type of composite carbon fiber and therefore features a low coefficient of elongation, while the surface layer is the same as that of an ordinary eaves trough and provides an excellent appearance.

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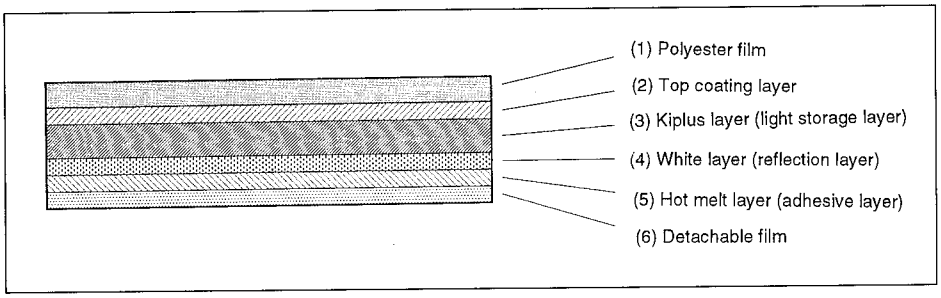
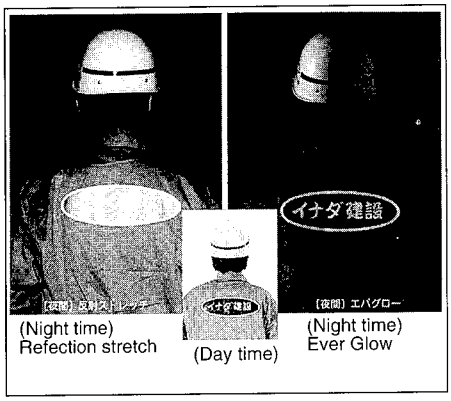
98-01-001-03
Heat Transfer Fabric Remaining Luminescent for Over 8 Hrs

Next I Co., Ltd. and Fukuoka Jufu Co., Ltd. have jointly developed a heat transfer fabric that remains luminescent for over 8 hrs in a dark environment. When the optical energy of sunlight or a fluorescent lamp is stored in the fabric for a fixed period of time, the fabric becomes luminescent in a dark environment. The companies plan to market the fabric for use as a new type of

Description of Ever Glow Residual Luminescence Heat Transfer Fabric	
Visible color	Light yellow
Luminous term	6-8 hrs
Luminous color	Blue-green
Product size (roll)	630 mm × 10 m
Sheet thickness (μm)	Surface part (pet) 100, light storage part 140, surface transparent part 20, white paste 40
Transfer temperature	110-150 °ßC
Transfer pressure	150-200 g/cm^2
Transfer time	10-30 s
Standard price	¥29,000/m (¥46,000/m^2)



Ever Glow Structure



material for manufacturing traffic accident prevention garments for use in the nighttime.

The new fabric is named Ever Glow. The luminous material Kiplus developed by Next I Co. which contains a rare earth metal oxide is applied as a transfer material for the fabric. Transferring the luminous material for 10-30 s under the conditions of 110-150 °C and pressure of 150-200 g/cm^2 enables the formed luminescent strip to be pasted onto a garment or leather product as a sticker.

Using a reflective heat transfer sheet Wing Tag developed at the same time permits the garment to glow with various fluorescent colors while a light is being directed on the garment. The fabric is marketed at a standard domestic price of ¥290,000 per roll of 63 cm × 10 m).

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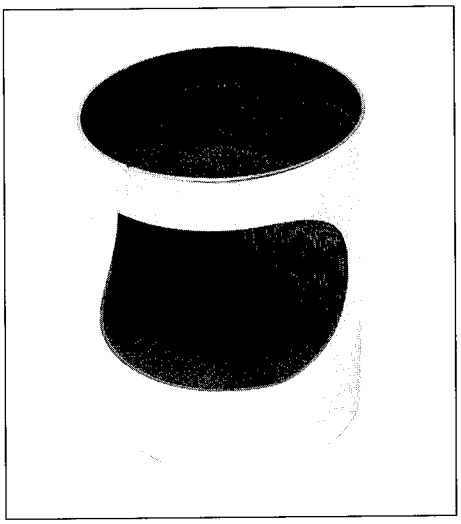
98-01-001-04

World's Thinnest Stainless Steel Catalyst Carrier

Nippon Steel Corp. has succeeded in developing and mass-producing metal honeycomb catalyst carriers made of 30 mm-thick heat-resistant stainless steel foil. This is the thinnest metal honeycomb catalyst carrier ever made in the world.

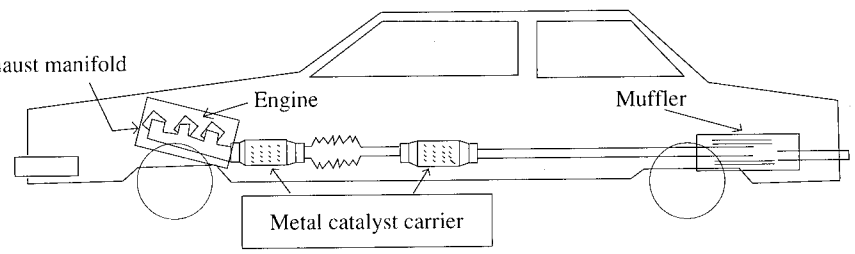
In the new metal catalyst carrier, the total thermal capacity of the metal honeycomb was reduced by 40% by reducing the thickness of the honeycomb foil from the conventional 50 mm to only 30 mm. The resulting fast temperature rise and early activation of the catalyst has greatly improved the waste gas cleaning efficiency. This also contributes to the miniaturization of catalyst carriers and the improved engine output through 30% reduction in permeability resistance.



Metal catalyst carrier

What is a metal catalyst carrier?

A metal catalyst carrier is a metallic honeycomb structure on whose surface a catalyst for automotive waste gas cleaning is attached (i.e., carried). The honeycomb structure is produced by helically winding corrugated and flat sheets made of heat-resistant stainless steel foil. The metal catalyst carrier is installed at the exhaust manifold and/or front pipe to remove HC, CO and NOx in the waste gas by catalytic action.



To commercialize the new metal catalyst carrier, several problems posed by the ultra-thinness of the stainless steel foil had to be solved. Due to its low rigidity, ultra-thin foil tended to be easily deformed, making honeycomb forming difficult. The problem was solved by the improvements in foil material shape and forming method.

Another problem was poor durability due to the weaker honeycomb structure. However, by developing a unique joined structure, the same durability as before was realized.

The application of the new metal catalyst carrier is being promoted in cooperation with Toyota Motor Corp. and will be installed on the 1998 export models for the American market.

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98-01-001-05

Superconducting Magnet Using High-Temperature Superconducting Coil

Japan Science and Technology Corp. has succeeded in developing a superconducting magnet using a "bismuth-based high Tc superconducting coil". The magnet attained a magnetic field of 7 T (Tesla). When cooled with a refrigerator, stable operation was achieved at 20 K, and excellent stability was displayed when subjected to high-ramp speed at a rate of 2 T/min without quenching.

The magnetic field of 7 T is the world's highest for a magnet consisting only of high-temperature superconducting oxide, and is comparable to that of metal type low-temperature superconducting magnets. The organization plans to utilize the magnet in further research to analyze electrochemical reactions in high magnetic fields of rapid change, which had been impossible with conventional types of coils. Being easy to handle, this magnet is anticipated to promote research in various experiments, especially in which a magnetic field had not been considered as a control element previously.

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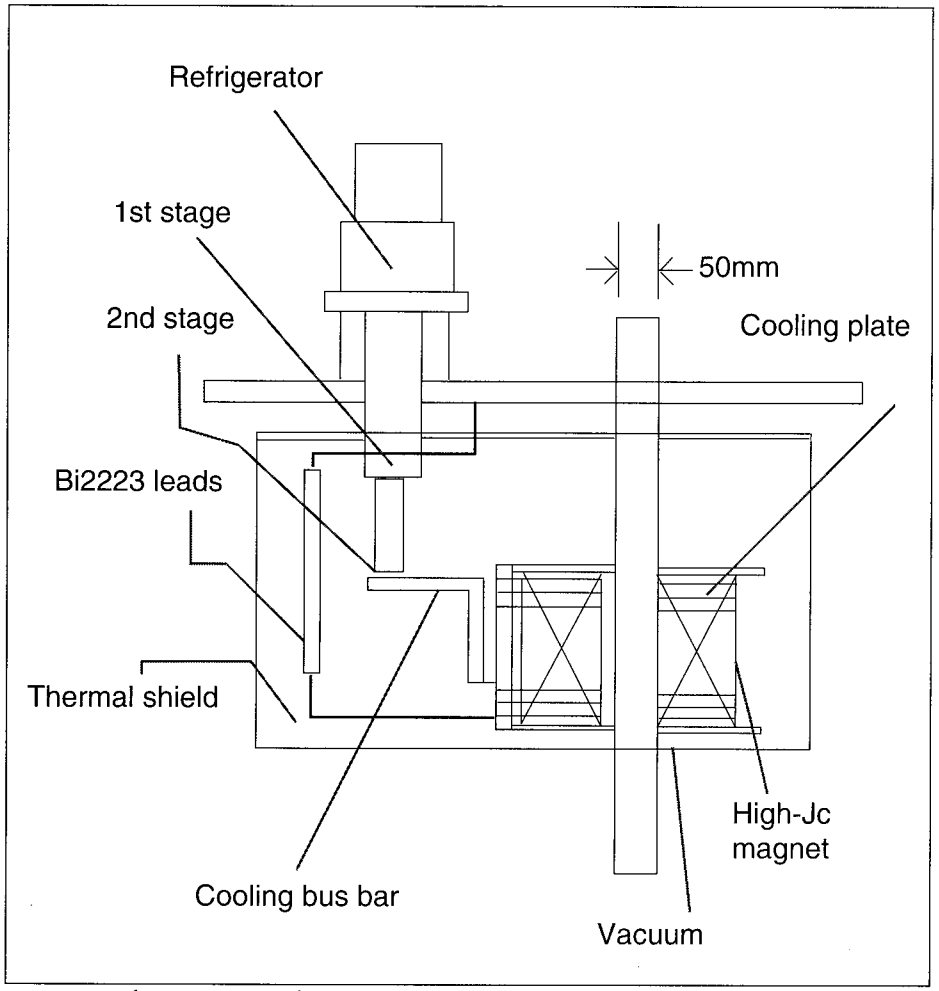


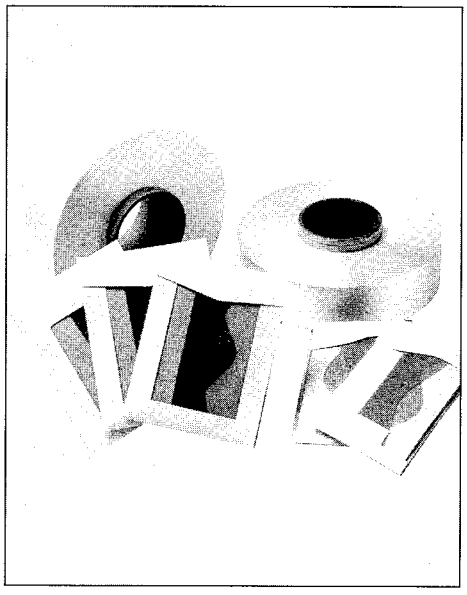
Magnet configuration (7 Tesla type)

98-01-001-06

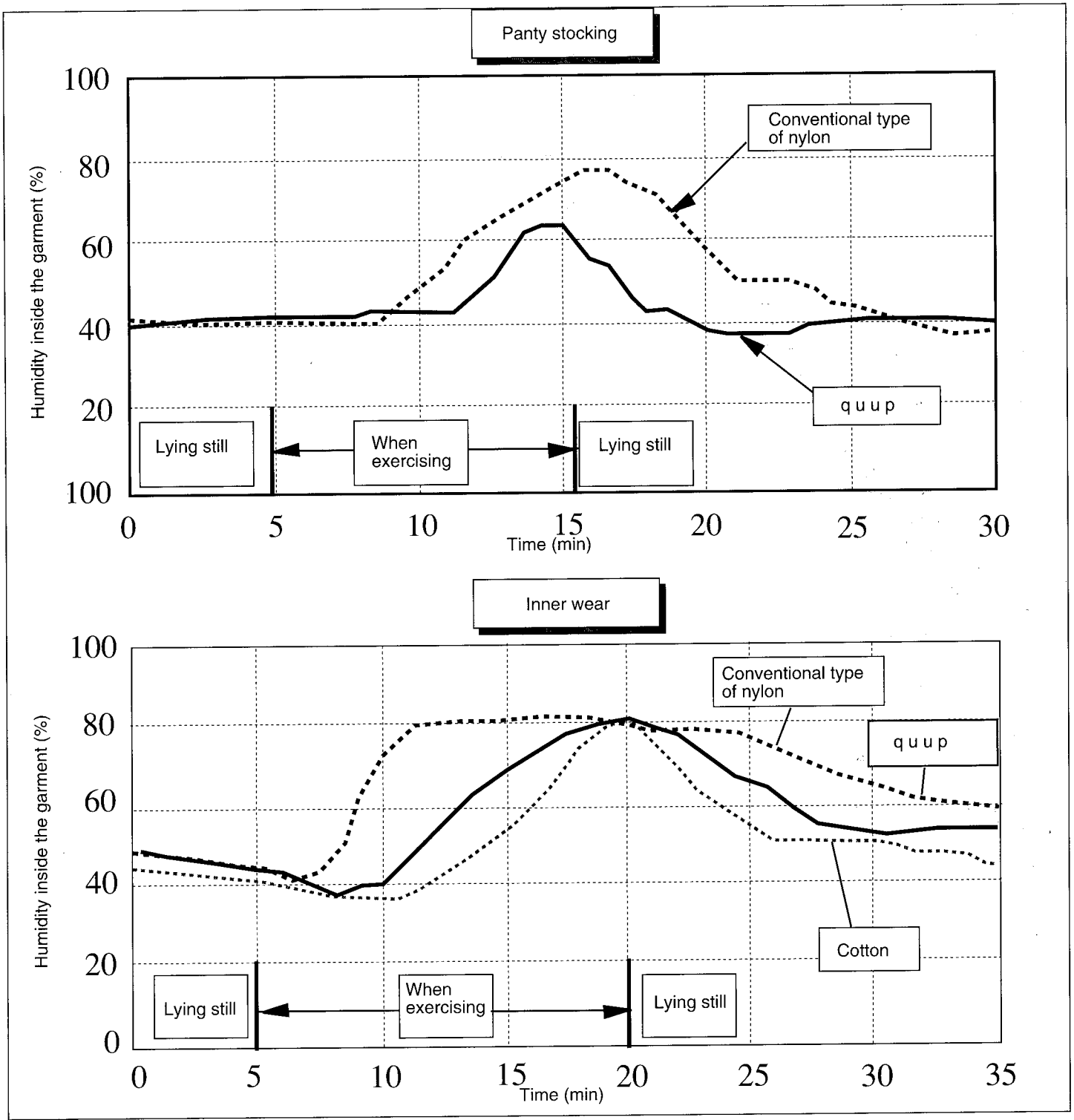
Nylon Fiber of Excellent Moisture Absorption and Discharge

Toray Industries, Inc. has developed a nylon fiber featuring moisture absorption and discharge properties comparable to those of cotton yarn. This nylon was finished into a fiber featuring excellent moisture absorption and discharge properties by mixing a special type of nitrogen polymer of excellent hydrophilicity into regular nylon molecules. This is the world's first case of development of a nylon fiber featuring moisture absorbance and discharge characteristics comparable to those of cotton.

The new type of nylon is named "quup". The special type of polymer has a size that is as fine as one-tenth that of the nylon molecule, and the fabric feel and smoothness



Nylon fiber with excellent moisture retention propesties "quup"



Moisture changes when used in light physical exercise (getting on and off a footstool) in relative humidity environment of 25 °C× 65%

are not impaired in any way. It absorbs moisture in an environment of high moisture, and discharges the moisture in a dry environment.

These distinct properties to absorb and discharge moisture are doubly better than those of conventional types of nylon, and about the same as those of cotton. Applications include the manufacture of panty stockings, and application to the manufacture of inner wears and sporting wears is presently under study.

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Electronics & Optics

98-01-002-01
Magnet Proximity Switches

Japan Pneumatics Co., Ltd. has developed magnet proximity switches with completely different features from those of conventional proximity switches and applied for patents worldwide.

The most unique feature is that all electronic components for switches are molded in thermosetting plastics, offering the following advantages. The light from an LED is visible from all angles, enabling confirmation of the functioning or position of the objects, according to specific needs. Four different colored plastics enhance the discernibility. The use of plastics allows the switches to be compact, light, and the price is very competitive.

All electronic components are molded in thermosetting plastics, so the plastic sealing provides water and oil resistance, allowing use of the switches submerged in water or oil. The bracket mounted snugly on the switch provides easy installation by screws, to holding with a band, or fitting on a rail. Use of vertical or horizontal load cords allow emitted light to be seen from all directions.

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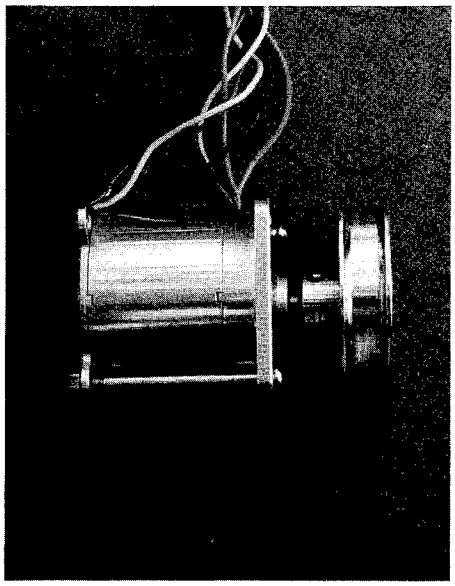
98-01-002-02
Motor With Reduced Power Consumption at Starting

K. R&D Co., Ltd. has developed a permanent magnet type bipolar synchronous motor that uses only a DC circuit at time of starting. When a rotary cycle that is synchronous with the power frequency is attained, a switch is made to AC permanent magnet revolution of excellent efficiency, so the same output as that of the conventional type of bipolar induction motor is obtained with about one-half of the usual input.

The prototype permanent magnet type bipolar synchronous motor has an outside diameter of 70 mm, and length of 130 mm. Experiments confirmed switching to synchronous revolution in about one second and an output of 35 W with an input of 50 W. With conventional types of bipolar induction motors of the same capacity, the output had been 33 W with an input of 100 W.

In the special mechanism at the rotor upper part, a rectification unit to accommodate the stator brushes for DC starting is provided to utilize the centrifugal force just prior to switching to synchronous revolution to lower the rectifiers and to isolate them from the brushes. A built-in cam performs automatic switching to 3,000 rpm at a frequency of 50 Hz or to 3,600 rpm at a frequency of 60 Hz.



Motor with reduced power consumption at starting

This power motor is designed to minimize the power consumption of various types of fans including the ventilating fan as well as the pump, so there is the advantage of suppressing motor heat generation. A DC starter and a special mechanism to detect the number of revolutions and to switch over to AC synchronous revolution are provided at the upper part of the rotor, and the stator coil consists of a simple winding, so the motor can be mass produced at about the same cost as that of a bipolar induction motor of the same output. The company plans to popularize the technique through technology transfer.

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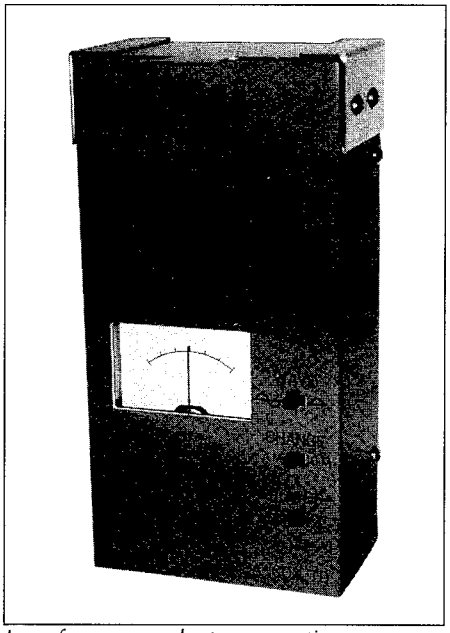
98-01-002-03
Low-Frequency Electromagnetic Wave Checker for Electric Fields

Kobe Dempa Co., Ltd. has developed a low-frequency magnetic wave checker model KSE-210 and has started distributing samples.

This electromagnetic wave checker enables the work of measuring an electric field, which is indispensable when accurately surveying the adverse influences of electromagnetic waves on the human body, to be accomplished automatically. In addition, it can display electromagnetic waves in the domains of both low frequency and extra-low frequency in both digital and analog values, and measure the positive and negative components separately.

Electromagnetic waves are currently measured primarily by detecting the magnetic fields, but when working with low-frequency domains, there is the problem that the magnetic fields and electric fields do not necessarily congrue, making it necessary to investigate the electric field separately.



Low-frequency electromagnetic wave checker

However, the electric field components are attenuated readily, so previously it had been difficult to measure the electric field with ease and at a low cost. The new low-frequency electromagnetic wave checker is ideal for measuring the influences of low-frequency electromagnetic waves such as those generated by home electrical appliances like TV units and electronic ranges, as well as medical treatment equipment and high-tension transmission lines. The results can be used to devise proper electromagnetic wave countermeasures. The checker is marketed at a domestic price of ¥150,000.

* ***Kobe Dempa Co., Ltd.***
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98-01-002-04 Antenna Duplexer for Cellular Phones

Sanyo Electronic Components Co., Ltd. has developed an SD Series antenna duplexer for cellular (portable) telephones that is designed compact by introducing a unique structure for electrode bonding. A special type of ceramic is used as the dielectric material to minimize the influences exerted by temperature changes.

The antenna duplexer is an antenna for cellular phones and serves to automatically select the frequency for both signal reception and transmission. Normally, an electronic component, which is indispensable for setting the frequency band that differs with communications specifications or manufacturer, is mounted outside the capacitor, but in this product the component is installed inside the capacitor so the antenna duplexer is very compact.

The dielectric material is a ceramic consisting of a mixture of titanium oxide, neodymium oxide and other materials to prevent the deterioration of the duplexer performance by temperature variations.

The new antenna duplexer is compatible with the rigid PCS specifications of the United States and the PCN specifications of Europe, and samples of the duplexer were distributed from December. The domestic sampling price is ¥2,000, and the company plans to market 250,000 units of the duplexer monthly.

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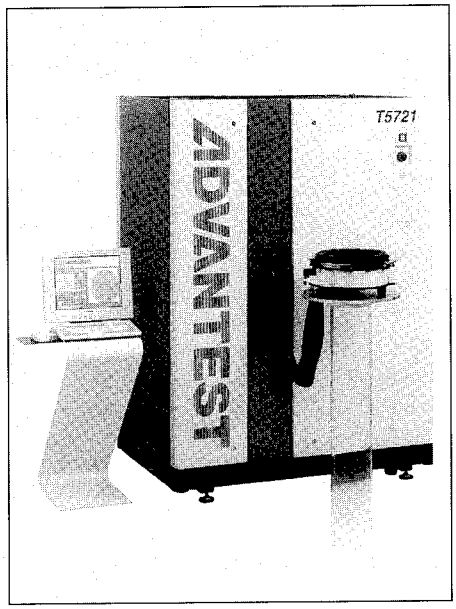
98-01-002-05 Flash Memory Test System

Advantest Corp. has developed a compact array tester T5721 featuring low price and high throughput for use when conducting tests in the preliminary process of producing flash memories.

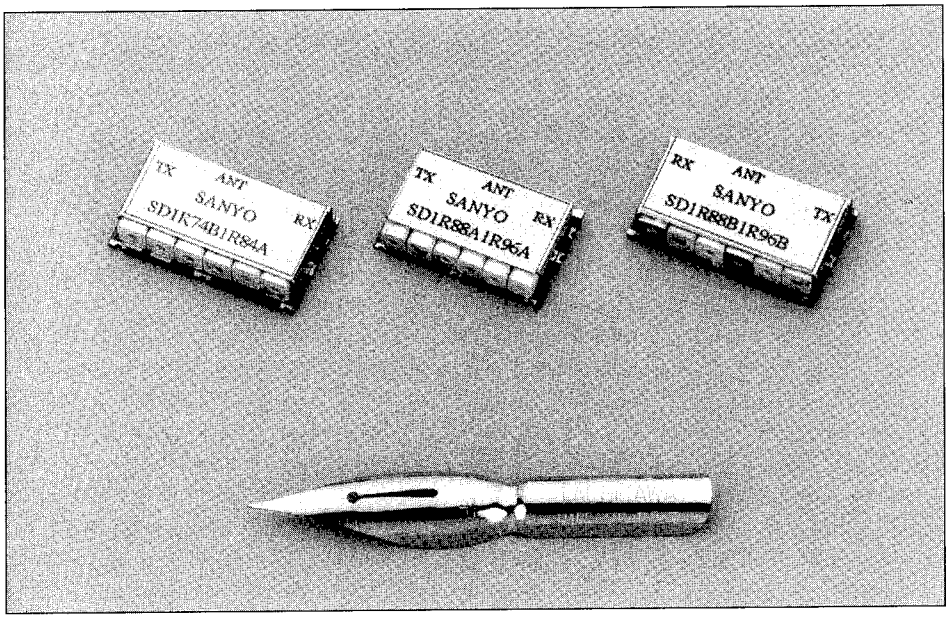
The newly developed T5721 employs Advantest's unique Test Array Architecture in addition to the flash memory test function which has been proven for use on the T5334. With the flash memory, the write and erase characteristics vary largely from device to device. Therefore, when conventional simultaneous measurement for a number of devices is performed, the throughput is affected by the device with the worst characteristic resulting in no major improvement in throughput.

To solve this problem, the Test Array Architecture of the T5721 allows each device under simultaneous measurement to have all the test functions and the computers in parallel operation for test control. This architecture remarkably reduces the test time and test cost for wafer test.



T5721 flash memory test system

In the wafer test, the speed of the crucial redundancy analysis has also been improved impressively. When the optional Memory Repair Analyzer (MRA) is mounted, the repairable resolution for replacing failed cells with spare cells can be obtained rapidly. In simultaneous measurement using the T5721, up to 8 flash memory devices with up to 48 signal pins can be tested at the same time and, optionally, the number of pins can be extended to 64. As for the test performance, the speed of functional measurement is 20 MHz and the total timing accuracy is ±}2.5 ns.



Antenna duplexer for cellular phones

The T5721 combines a compact test unit and power-saving operation. Because a number of highly integrated CMOS devices are used at the core of the test function, the number of parts have remarkably been reduced. In addition, it realizes a power consumption which is 1/5 times and a size which is 2/3 times that of an equivalent model (in-house comparison), as well as reduction of down-time because of the improved quality.

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98-01-002-06

64 Mbyte Flash Memory Card for Personal Computers

Fujitsu, Ltd. has developed a 64-Mbyte flash memory card for personal computers and started distributing samples of the memory card from October, 1997.

This is a card worked with a unit power of 5 V and contains 32 units of 16-Mbit flash memory elements (special-purpose write-in and read-out memory elements enabling flash electrical erasure and restorage). The introduction of an XIP function enables application software to be used directly with the card program without intervention of the main memory.

Also, since the flash memory card is compatible with the FTL software for working the flash memory card on the personal computer, operations such as data input and retrieval are accomplished with ease in the same manner as handling a floppy disk.

The data access time is 200 ns, the data storage speed 8 microsec/word, and data control is possible in units of 128 kbyte. The card is distributed at a domestic sampling price of ¥120,000.

* ***Fujitsu Limited***
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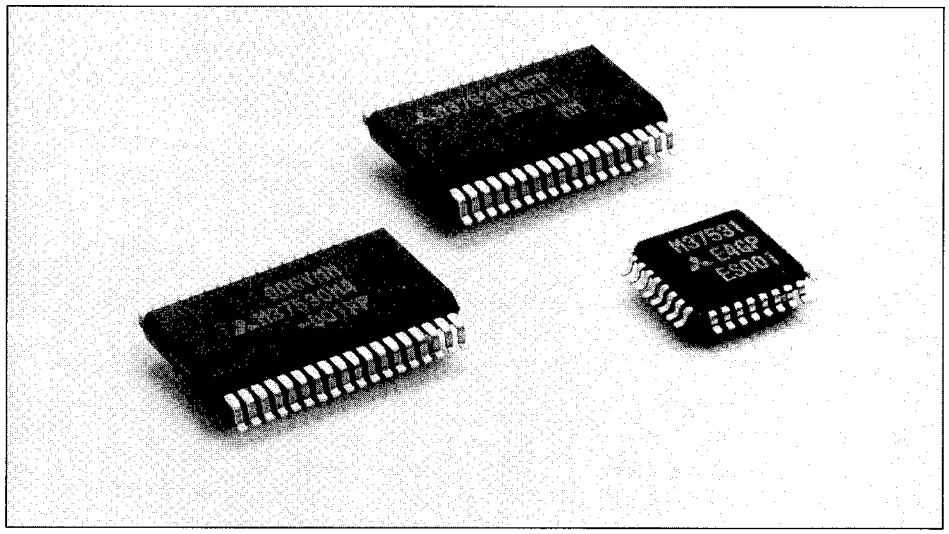
98-01-002-07

8-Bit Microcomputer with Universal Serial Interface Function

Mitsubishi Electric Corp. and Mitsubishi Electric Semiconductor Software Co., Ltd. have jointly developed an 8-bit microcomputer that incorporates a universal serial interface (USB) function that is employed as an interface when linking peripheral equipment with the Windows 98 next-generation personal computer operating system (OS).



8-bit microcomputer with universal serial interface function

The newly developed microcomputer M37530M4 incorporates a control circuit and a drive circuit which are indispensable for engaging in low-speed universal serial interface communications of 1.5 Mbit/s that is necessary for signal input/output into the peripheral equipment of personal computers.

It is usable as a keyboard, mouse or game joystick, and has been made compact by processing a portion of the circuits necessary for universal serial interface control with software. A precision analog/digital (A/D) converter has also been assembled into a single chip, which is used to smoothen cursor movements on the display unit.

The domestic selling price of a microcomputer for trial use, incorporating a primary rewriting memory unit, is ¥800, and that of a mass-production type ¥300. The company plans to manufacture 10,000 units/month of each of these two types of microcomputers.

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Machinery & Mechatronics

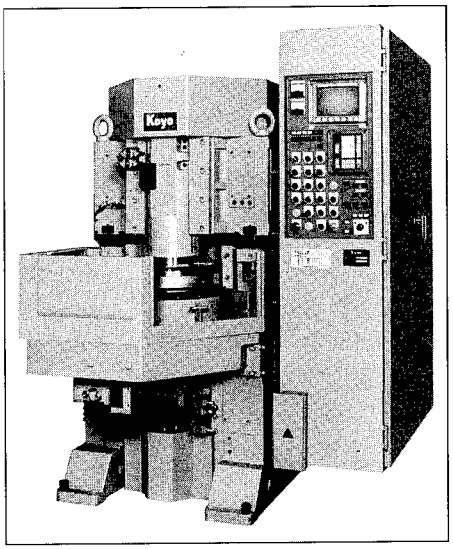
98-01-003-01

High-Performance Surface Grinder for Grinding Glass Wafers

Koyo Machinery Industrial Co., Ltd. has established a new process to grind glass wafers for magnetic disks, and has developed a high-performance surface grinder by applying the technique.

The new surface grinder is used in the primary-stage surface grinding that is accomplished in several stages. To enable processing of glass wafers, it uses a diamond wheels and the machine rigidity has been improved. The grinding accuracy is a parallelism of less than 8 μm and a flatness of less than 10 μm, which amply satisfy the accuracy demands for primary-stage grinding.

By using a magazine and workpiece supply system as well as a thickness inspection system, the system can be made fully automatic. As with ordinary grinders, it uses only a cooling fluid (coolant), and grinding swarf is removed with a filtration system to retain a clean working environment. The target workpieces are crystal glass plates with diameters of 2.5-3.5 inches and thickness of about 0.6 mm.



High-performance surface grinder for grinding glass wafers

The hard disks for magnetic disks are normally made of aluminum, but the recent trend for capacity enlargement is triggering a shift from the use of aluminum to the use of glass. Glass wafers usually undergo surface grinding by lapping, but much time and labor are necessary for workpiece engagement and disengagement in batch processing, or the production efficiency is poor. In addition, maintaining a clean working environment had been difficult due to the use of special types of solvents. The new surface grinding technique resolves all these problems. The grinder is marketed at a domestic price of ¥35 million.

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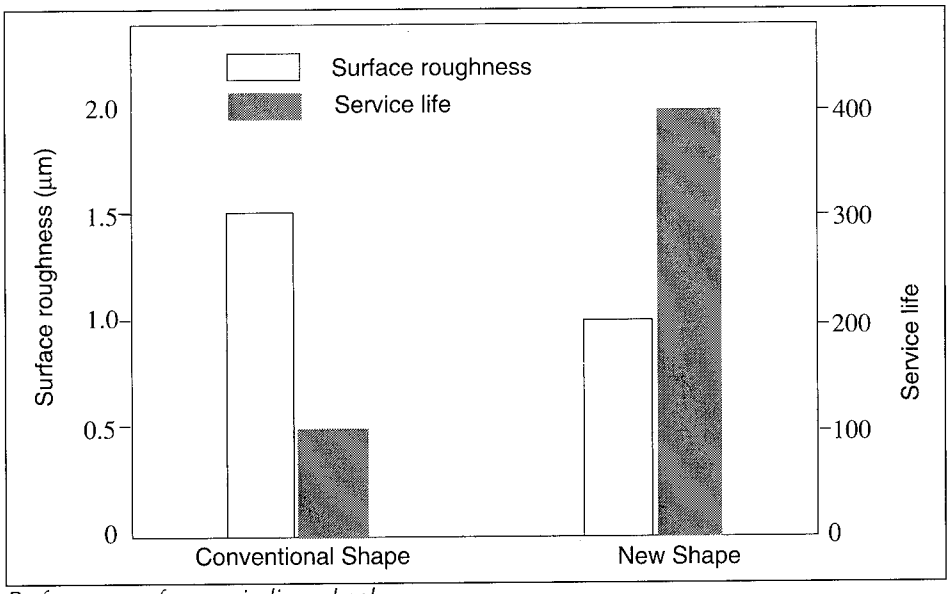
98-01-003-02

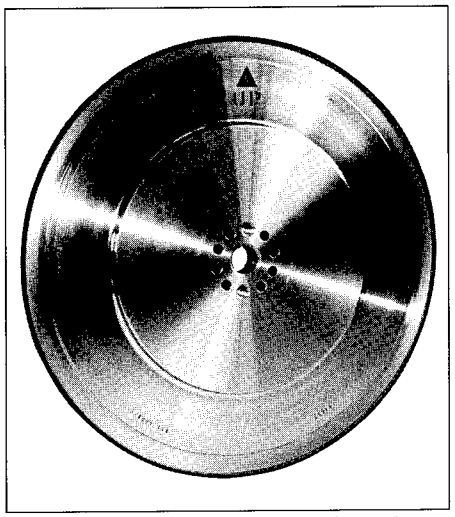
Super Abrasive Grinding Wheel for High-Speed Grinding Machines

Osaka Diamond Industrial Co., Ltd. has developed a new type of vitrified bond super abrasive grinding wheel that enables contour grinding of both soft and hard materials.

Automobile parts are produced by the diversified small-lot manufacturing method, and grinding with automated lines is in wide use to improve productivity. When milling these parts, cemented carbide alloy cutting tools are used for working with soft materials, and polycrystal-



Performance of new grinding wheel.



Photograph of newly developed grinding wheel

line CBN cutting tools for working with hard materials, but attaining the desirable level of accuracy is difficult with these tools.

As a recent trend, automobile parts and other parts must be produced most accurately, so the development of a super abrasive wheel enabling the grinding of soft materials is in great need. These parts are diversified, small lot type parts consisting of a mixture of soft and hard materials, so it will be necessary to replace these grinding wheels every time a soft or hard material is worked with, which naturally lowers the productivity. Accurate grinding of hard materials will be possible by using super abrasive grinding wheels, but these wheels cannot be used for working with soft materials since they are easily loaded or their service lives shortened considerably.

The company commenced research to develop a grinding wheel usable for both soft and hard materials and first produced a super abrasive grinding wheel with a width of 5-10 mm and confirmed that high-performance, precision grinding is possible of both soft and hard materials without problem when grinding is performed at a high speed exceeding 80 m/s (patents already acquired). Based on these results, the company next developed a new type of vitrified bond super abrasive grinding wheel for ultra high-speed grinding that features an excellent heat resistance and high-strength wheel structure and which enables ultra high-speed grinding even in the range of high peripheral speeds safely. Next, the company tried to develop a grinding wheel of ideal shape and featuring a better performance and higher accuracy, and developed a grinding wheel featuring an ideal surface roughness and longer service life than conventional types of grinding wheels. The figure shows the performance of this new grinding wheel.

Based on these results, the company then developed a new type of vitrified bond super abrasive grinding wheel for ultra high speed grinding that is usable for grinding both soft and hard materials and featuring an ideal shape enabling highly efficient and accurate grinding. Using the superfine grain grinding wheel for ultra high-speed grinding enables both soft and hard steel and non-ferrous metals to be ma-

chined with a single wheel, and since the grind wheel has an ideal shape, it enables grinding at a high efficiency and with great accuracy.

* ***Osaka Diamond Industrial Co., Ltd.***
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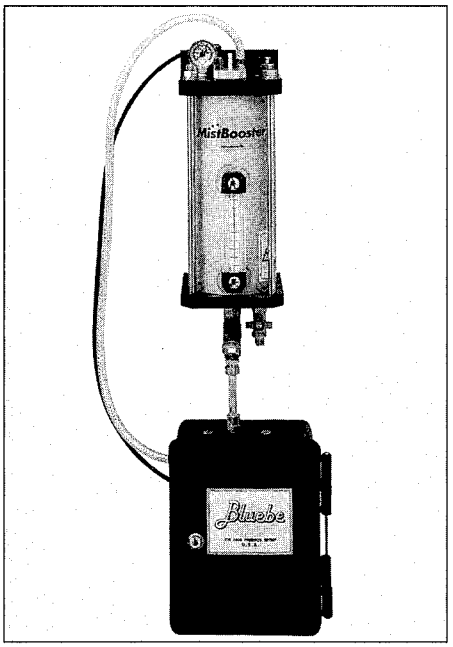
98-01-003-03

Oil Booster Reduces Cutting Oils of Machining Centers

Fuji Koeki Co., Ltd. has marketed a special-purpose oil mist generator Oil Booster for spindle-through type machining centers that supplies cutting oils through tools. Due to the small volume of supplied cutting oil, machining is possible in the dry state, so Oil Booster serves to maintain a clean working environment.



Oil Booster

The cutting oil supplied by the tool is only 2-10 cm^3/hr, so the working environment is maintained in a clean state, and the products need not be washed after they are machined, so the waste water treatment cost is reduced considerably, and the fire hazard eliminated almost completely. The cutting oil can be vegetable oils featuring excellent circulation, biodegradability and safety, and since the oil is used in ultrafine particle form, there is no oil mist adhesion in the workplace. The oil booster is marketed at a domestic price of ¥250,000.

* ***Fuji Koeki Co., Ltd.***
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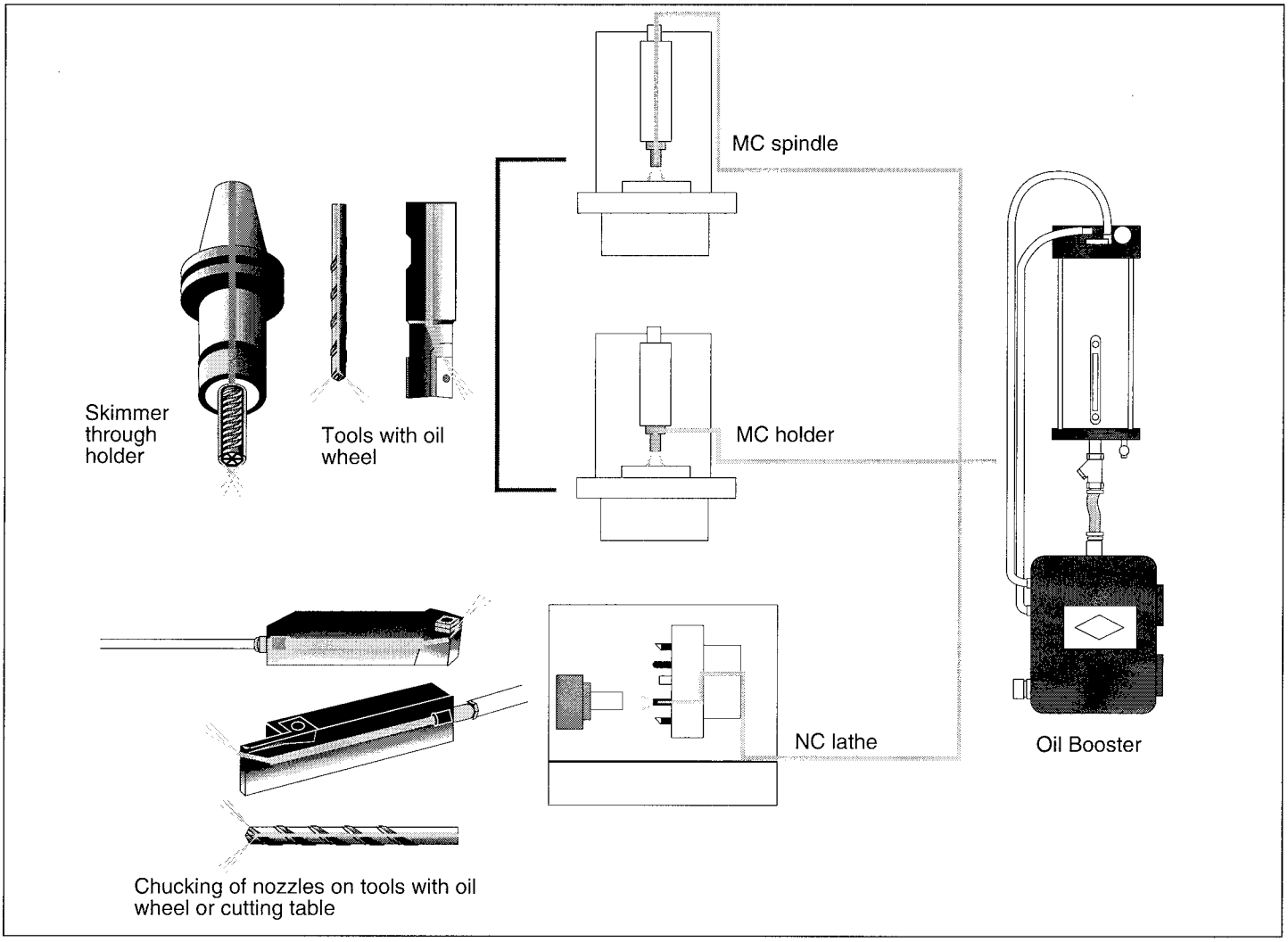
Fax: +81-45-942-7425



Installation diagram of Oil Booster

98-01-003-04

Bicycle Stand Enabling Maintenance Work in Standing Position

Ohata Seisakusho Co., Ltd. has developed a bicycle stand called Cycle Byup that enables the awkward work of bicycle repair and maintenance work requiring crouching to performed in the standing position.

Cycle Byup enables the bicycle frame to be checked with the bicycle laid down, or the bicycle can be raised and stopped at any desirable optional position, even rotated, so repair and maintenance work can be accomplished in a non-tiring attitude. It can hold any type of bicycle frame, raise or stop at any desirable position by working a foot panel (switch), or turn the bicycle to any desirable angle for ease of repair and maintenance work. Two tool racks which can be moved about freely are also provided, so there is no need to lose time searching for tools.

Cycle Byup allows flexible movement of the bicycle up or down, and rotation through 360° to any desirable position. The adjustable chucking mechanism that permits holding of any type of frame. There is little noise and a safety device prevents excessive frame lowering and resultant damage. The arm can be folded upward when not in use and two tool racks enable convenient storage of tools. A 100-V light holder is included and a 100-V power unit and a 200-W motor are used. Hardly any lubrication is necessary.

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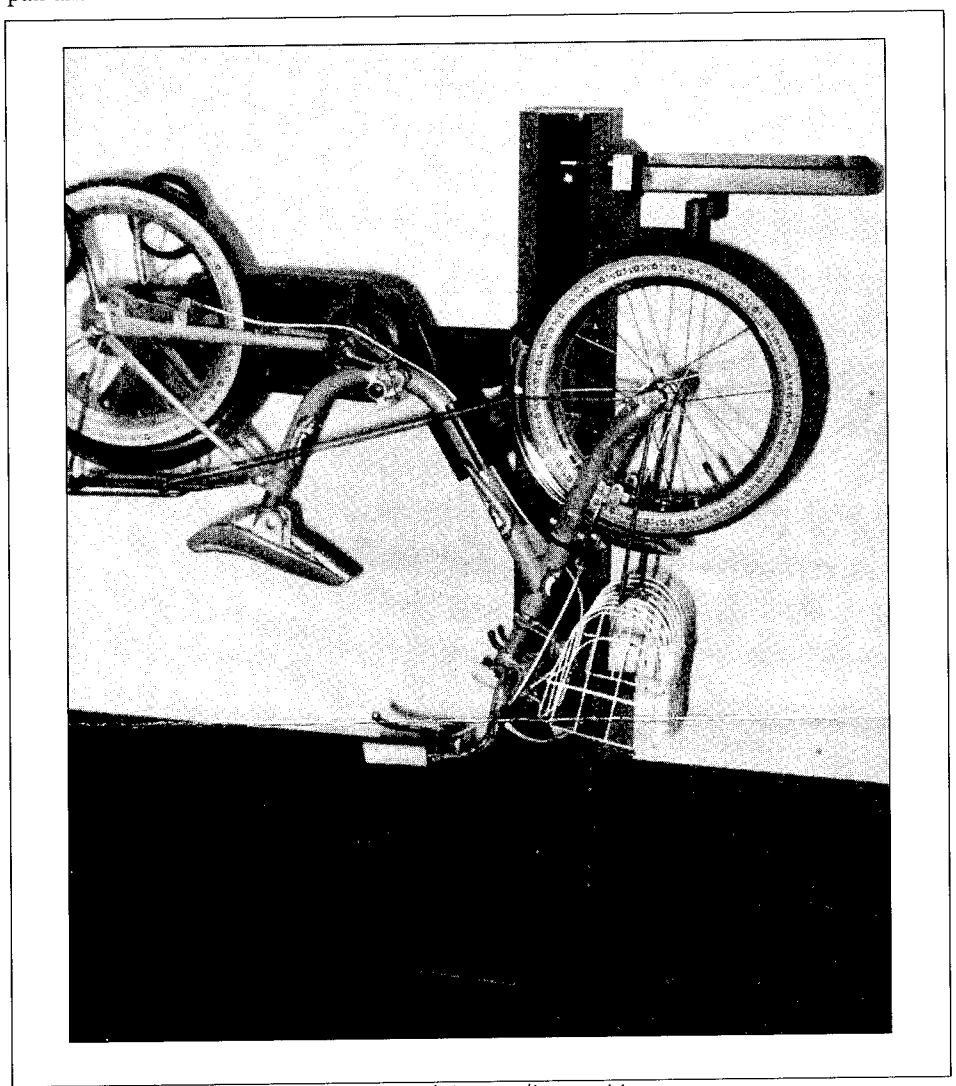

Bicycle stand enabling maintenance work in standing position

98-01-003-05

World's First Large Water Discharge Pump Station Using L Type Gas Turbine

Kubota Corp. and Kawasaki Heavy Industries, Ltd. have jointly developed the world's first large water discharge pump station using an L type gas turbine LGT-01 which is designed to prevent floods caused by typhoons and torrential downpours.

As a recent trend, water discharge pump facilities are becoming ever larger and serving wider areas to prevent floods caused by typhoons and local torrential downpours, making cost reduction a major concern when constructing these facilities. Also, since problems to these facilities culminate in enormous regional damage, securing the reliabilities of these facilities has become a critical social demand. Therefore, the prime movers to drive these large-capacity pumps are gas turbines of high reliability, and research is in progress to design gas turbines of ever compact sizes in order to reduce facility installation spaces.

The large water discharge pump facility was developed by the two companies. Kubota was in charge of overall engineering and Kawasaki Heavy Industries introduced and commercialized the L type gas turbine LGT-01 with the output axis faced directly downward for the world's first time. The pump facility ground space is influenced by the size of the prime mover, but due to the introduction of the L type gas turbine, the gas turbine can be installed on the upper part of the underground pump. With the same output, the housing area of the pump facility is reduced by about 40% compared with that of the conventional type of horizontal axis gas turbine pump facility. Also, the underground space that is influenced by the size of the pump and waterway has also been decreased by increasing the speeds of the pump and the waterway.

The L type gas turbine LGT-01 developed successfully for the world's first time has a maximum output of 15,000 HP class and can drive a pump with a water discharging capacity of 50-100 m^3/s, the country's largest. Also, the turbine is based on the aircraft converted type gas turbine

backed by a fine record of performance as a land and marine turbine, and therefore has a construction displaying excellent performance and reliability. The application of this L type gas turbine to the water discharge pump facility eliminates the need for a bevel gear type reduction gear system that is indispensable with the conventional horizontal axle gas turbine for use as a vertical type drive axle, which enables considerable reduction of installation space and gear noise. In addition, the L type gas turbine introduces the digital type combustion control system, so features excellent operability and maintenance. The companies plan to cooperate in business activities delivering the large water discharge pump station to large pumping stations to be constructed in the future.

* ***Kubota Corporation***
Public Affairs Office
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Tel: +81-6-648-2388
Fax: +81-6-648-2398

Information & Communications

98-01-004-01

Digital Thin Film Diode Color LCD Panel Block

Seiko Epson Corp. has started distributing samples of a digital thin film diode (D-TFD) color LCD panel block that is a highly improved version of the conventional metal-insulator-metal (MIM) active matrix crystal. It is available in the 2.0 type LB20 HR-BC00 version and the 2.8 type LB28MC-BC00 version.

The pixel density is increased by 1.5 times and the surface brightness by 2.0 times, while the side light system is adopted for background illumination by which its thickness has been reduced to as thin as 8.5-11.2 mm. The resolution is 481 x 234 dots. The company plans to sell the digital thin film diode color LCD panel block for use with digital still cameras, camcoders and various types of monitors.

The D-TFD color LCD panel block has a digital gradient and, in contrast to a thin film transistor (TFT) liquid crystal of analog gradient, the entire circuit including its interface can be digitalized to enable low power consumption with ease. The miniature size and high numerical aperture ratio allow more complex fabrication than ordinary types of TFTs.

* ***Seiko Epson Corporation.***
ED Sales Promotion Group
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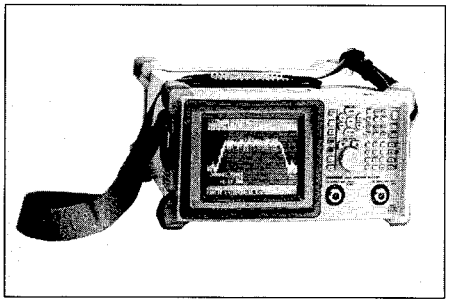
98-01-004-02

Portable Spectrum Analyzer with Built-In N-CDMA Measurement Option

Advantest Corp. has developed and marketed a measurement option for the light and compact U3641 spectrum analyzer, which has an established reputation for field use. The option allows measurement of transmission characteristics of N-CDMA (narrow-band code division multiple access) mobile communication equipment.

Thanks to its portability, the U3641 incorporating the newly developed option allows on-site measurement of RF transmission characteristics other than the modulation analysis function.



Portable Spectrum Analyzer with Built-In N-CDMA Measurement Option

The major functions have the built-in FORWARD and REVERSE frequency channel tables for the Cellular and PCD (Personal Communication System) mobile communication standards, enabling tuning by the channel number. The characteristics of the tuned transmission channel, such as the channel power, occupied frequency band, adjacent channel leakage power, and spurious signalds, can be measured. At each measurement, a specific limit line is set automatically and the Pass/Fail test can be performed. In addition, the option is provided with a built-in preamplifier, accommodating high-sensitivity measurement. The U3641 with this option is light (about 7kg) and compact and effective for expansion.

* ***Advantest Corporation***
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Tel: +81-3-3342-7500
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Major features of the U3641

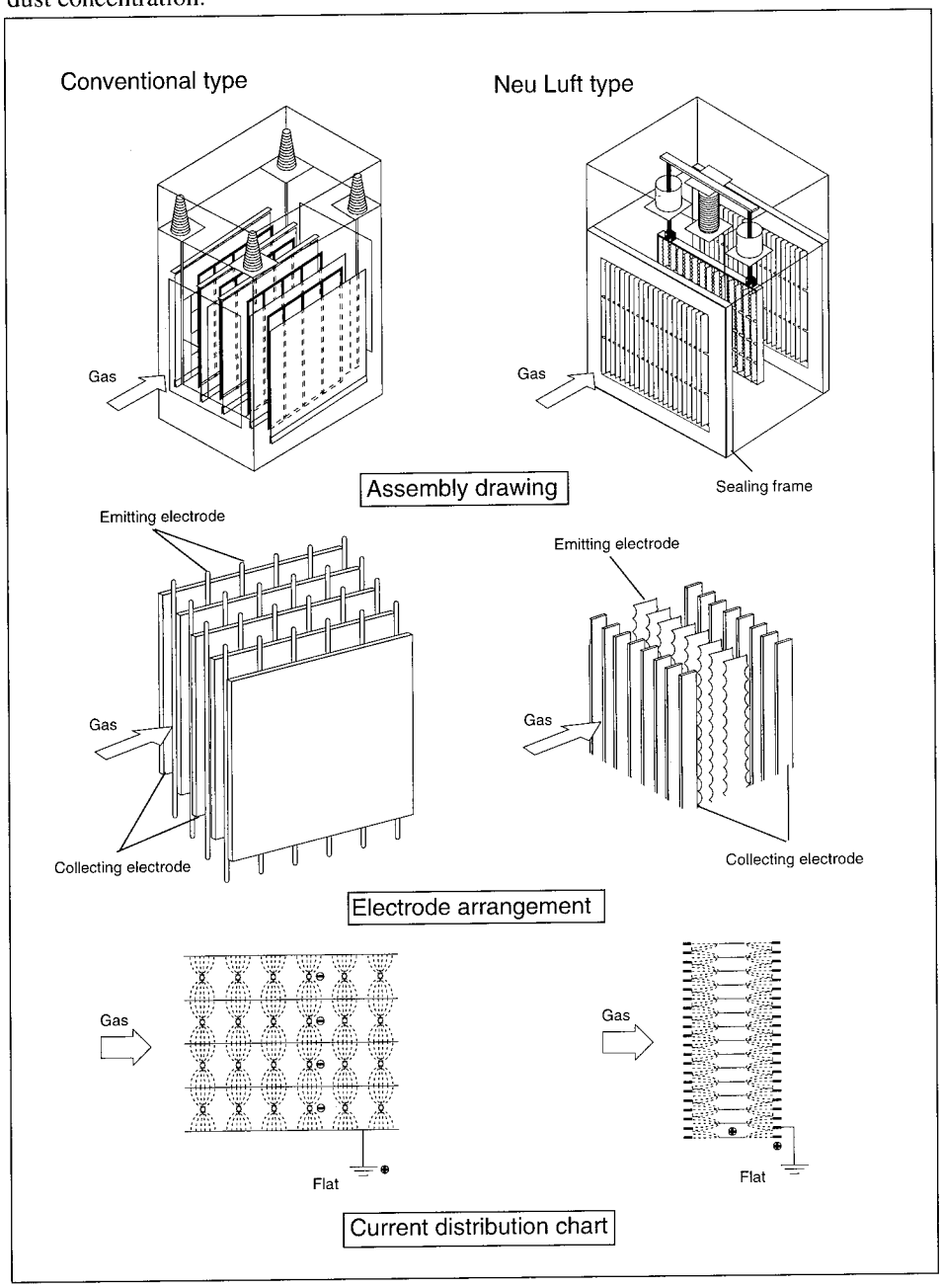
Items	Specifications
Frequency range	9kHz to 3.0GHz
Frequency stability	Residual FM over 60Hzp-p/100ms (ZERO span)
	Frequency drift < 150Hz/min (SPAN over 10kHz)
Frequency bandwidth	1kHz to 3MHz (1 to 3 sequences) (3 dB) 100Hz,
	300Hz (when the option 26 is mounted)
Sweep	50 us to 1,000 s (at ZERO span)
Power supply	3-way power supply system including battery operation (100 VAC/200VAC, external Dc, and battery pack)
Indicator	6-inch color TFT LCD
Weight	Approx. 6.9kg or less

Process & Production Engineering

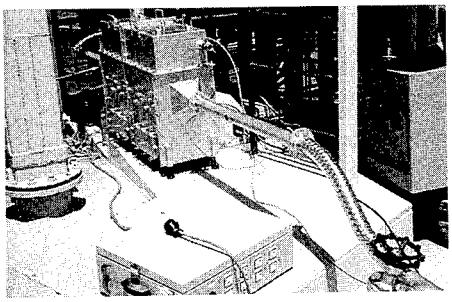
98-01-005-01
Electrostatic Precipitator for Collecting Submicron Dust Particles

ERDEC Co., Ltd. has developed the Neu Luft Electrostatic Precipitator, which achieves a high dust collection performance even in an environment of ultra low dust concentration.

This precipitator was used to collect dust subsequent to the outlet duct of a bag filter in a non ferric metal processing plant. The dust concentration after the bag filter was 2 mg/m³N, which clears the legally prescribed exhaust dust concentration, but the new precipitator attained a dust collection efficiency as high as 81-93%, so the outlet dust concentration achieved a very high cleanliness degree of approximate 0.1 mg/m³N.



Construction comparison chart and current distribution chart



Neu Luft Electrostatic Precipitator

The precipitator used in the experiments attained a stable current condition at a voltage of approximate 15 kV. The low power consumption and easy of maintenance due to the small number of components permits the new electrostatic precipitator to be operated at a low running cost. It is compact with a width of 280 mm, length of 800 mm, and height of 580 mm.

The collecting electrodes and emitting electrodes are arranged in parallel with respect to the flow of treated gas in a conventional precipitator. In the new Neu Luft, collection units combining the saw-edged type emitting electrodes and the collecting electrodes of band steel in strip, are arranged to a cross the gas flow.

This design decreases the dust collection area (by 40%) and also makes the precipitator volume more 30% compact compared with the conventional electrostatic precipitator.

* ***ERDEC Co., Ltd.***
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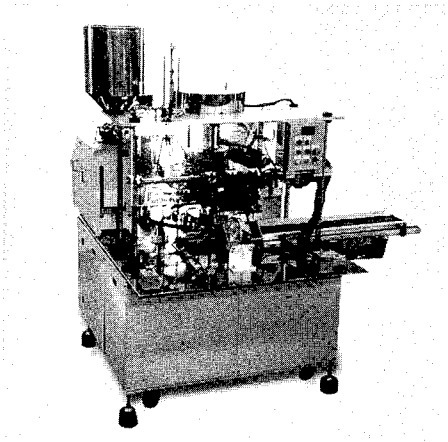
98-01-005-02
Filling and Sealing Machine for Pouch Containers

Pola Chemical Industries Inc. has developed a filling and sealing machine PFS-800 for pouch containers. The machine is for filling cosmetics, medical drugs, foods, inks, paints, adhesives and other products into packs, and enables drip-free filling. It is marketed at a domestic price of ¥8,500,000.

This filling and sealing machine uses an unique shut nozzle developed by the company, enables filling of low-viscosity (liquid) and high viscosity (adhesives) sub-



Filling and sealing machine PFS-800 for pouch containers

stances without dripping. Thus, no improper sealing occurs when the contents are adhered on the sealing part. Filling and sealing are accomplished automatically simply by setting the containers on a magazine. The filling unit can also be used independently to fill bottles and tubes with their contents.

The machine is usable for working with pouch containers 120-220 mm long and 80-180 mm wide. The contents per charge can be changed between 10-700 ml, and the filling capacity is 12 pouches/min. The machine has a size of (L)1,700 × (W)1,200 × (H)2,300 mm, and weighs 1,000 kg.

* ***Pola Chemical Industries Inc.***
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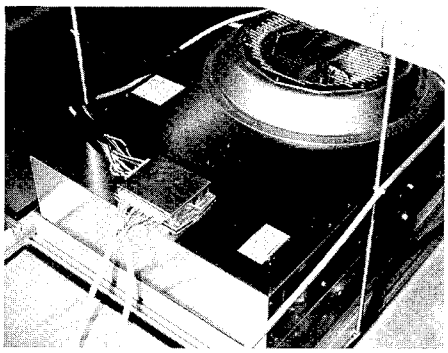
98-01-005-03
Intelligent Control System for Filter/Fan Units

Hitachi Plant Engineering & Construction Co., Ltd. has developed an intelligent filter/fan unit (FFU) control system for clean rooms that enables substantial energy conservation. The integrated high-performance filters and fans are controlled independently to achieve accurate air conditioning control that enables energy conservation of about 20%. The control wiring is also decreased considerably compared with conventional systems to reduce the cost of FFU control wiring work by about 30%.

The system was developed by utilizing an electronic arithmetic circuit neuron chip for the distributed processing of network communications, which was commercialized by Eshlong Inc., a US system equipment and software development company. The system consists of ultracompact control equipment nodes mounting neuron chips, with each node engaging in mutual communications to conduct independent distributed array control systems.

Up till now, an average of six control wires had been necessary to link each FFU system to the control/monitoring panel. With the new system, network communications is performed between the respective nodes, so a single control wire suffices. The reduction of control wires easens maintenance, also enables FFUs to be added and system layouts to be altered without requiring any special skill. In addition, monitoring and control can now be accomplished with a desktop personal computer.



Intelligent filter/fan unit (FFU) control system

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Construction & Transportation

98-01-006-01
Tire for Electric Automobiles

Sumitomo Rubber Industries, Ltd. has developed its first electric automobile tire D.E.V.-01 that is used on the electric automobile Honda EV.

The electric automobile is run by batteries, so its main characteristics are that the vehicle is quite heavy, the running distance per battery charge short, and runs noiselessly since it is operated with electric motors. The tire used by electric automobiles must feature properties such as low friction, low fuel cost and minimal noise.

To commercialize such a tire, the company developed a tire thread pattern that has a low rolling resistance when used with a high inside pressure. Increasing the tire block rigidity is effective for decreasing the rolling resistance when using the tire at a high inside pressure. In addition, it established a special-purpose tire pattern designing technique that increases the tire edge component to strike a good balance with the water expelling performance.

To reduce the electric automobile rolling resistance while maintaining good comfort and stable operability, a low fuel cost material was also developed that uses a new reinforcing agent (carbon). As a result, the company succeeded in reducing the electric automobile tire rolling resis-

Electric automobile tire D.E.V.-01

:ance by as much as 50% compared with a standard type of tire while maintaining the basic characteristics.

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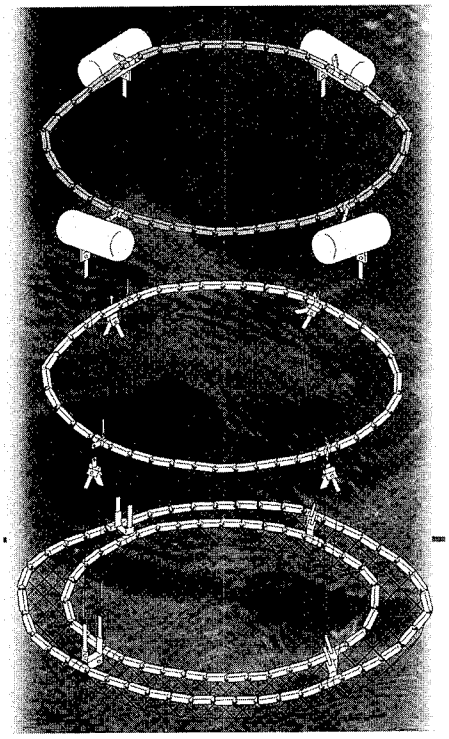
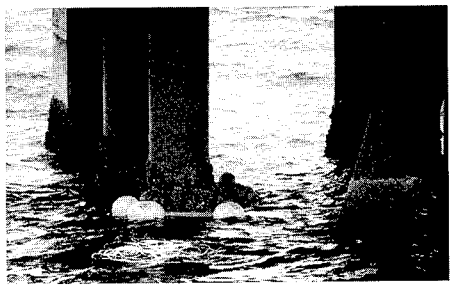
98-01-006-02
System Utilizing Waves to Automatically Remove Shells Adhering on Marine Structures

Kuribayashi Kiko Co., Ltd. has developed a system that utilizes wave action to automatically remove shells and other marine organisms adhering on marine structures. Compared with conventional manual work, the system is a safe, floating type system permitting removal at low cost by utilizing the vertical motions of the waves and tides. The company is accepting marine organism removal orders from all parts of the country, and is selling only the unit overseas.

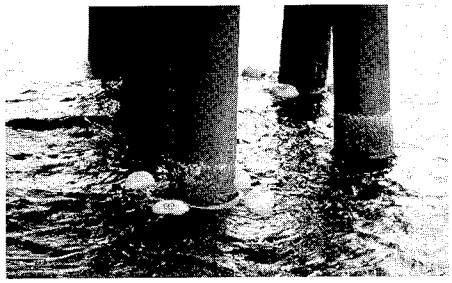
The newly developed system, called Clean Float, is consists of a linkage of pieces 12 cm long, 3.5 cm wide and made of polypropylene resin. It is encircled around the girders, then moved up and down by the natural tidal rises and falls, during which process the shells and other marine organisms adhering on the pillars are removed by the rings. The removed organisms are collected in a net attached to the system.



Clean Float general drawing



Clean float installation



After removing

With the method generally adopted to remove marine organisms from marine structures, divers use jet pumps for removal. However, the operation of this method is influenced largely by the weather and securing safety is difficult. Clean Float enables marine organisms to be removed safely without being influenced by the weather and without requiring any direct labor for removal.

The adhesion of shells and other marine organisms on bridge girders and pier pillars accelerate corrosion, fatigue and concrete deterioration to shorten the service lives of marine structures. The part of the seas from the surface to a depth of about 10 m is influenced largely by waves and currents, and this is also the part where marine organisms proliferate the most. In addition, the adhesion of marine organisms enlarges the diameters of the pillars and increases the influences of waves, so increases vibrations which accelerate pillar deterioration.

Clean Float is fitted onto girders and pillars by Kuribayashi Kiko Co., Ltd. and Kuribayashi Trading Co., Ltd., an affiliate, which accepts orders for these tasks. The charge for the fitting service inside bays is ¥7,000/m^2 (only the work cost), and the charge for outside bay service is ¥10,000/m^2.

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Agent

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98-01-006-03
Technique to Construct Diaphragm Walls

Toda Corp. has established a highly economical technique to construct diaphragm walls (reinforced concrete continuous walls) of excellent quality with various functions. The company had been engaged in research to improve and develop an innovative technique to construct diaphragm walls, and obtained a commendation from the Building Center of Japan for a bidirectional plate wall construction technique, a combined walls construction technique and the introduction of a excavation machine

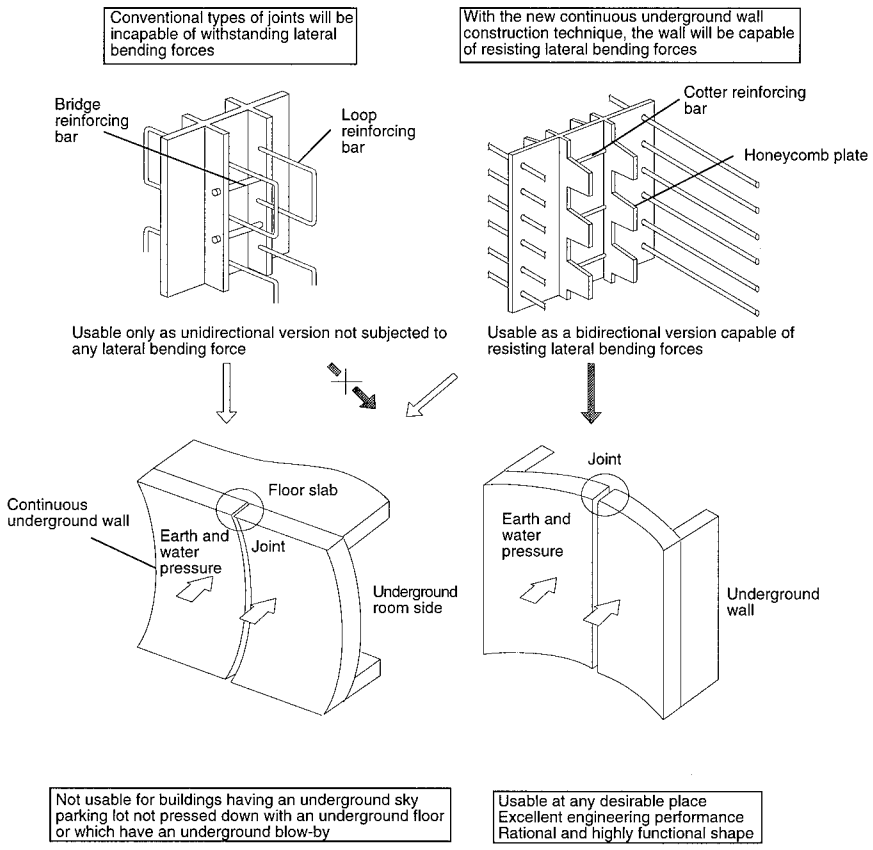
The bidirectional plate wall construction technique is designed to permit the construction of extra-wide underground structures, stereo underground parking lots and the circular shaft. The newly developed bidirectional wall is characterized by a rational shape that takes into account the structural performances and working ease, and features high quality and functions in addition to low cost (patents pending).

The combined wall construction technique is designed to enable a post-cast underground wall to be utilized in a unit structure with an existing diaphragm wall, and enables reduction of excavation volume and costs when constructing diaphragm walls, as well as better utilization of underground spaces. The establishment of the new technique promotes more mechanized advancement of projects and improved structural quality. The structural characteristics and performances of the new construction technique have been fully confirmed through structural experiments conducted by using model and real diaphragm walls.

Excavation tests of a high-performance excavation machine were conducted with

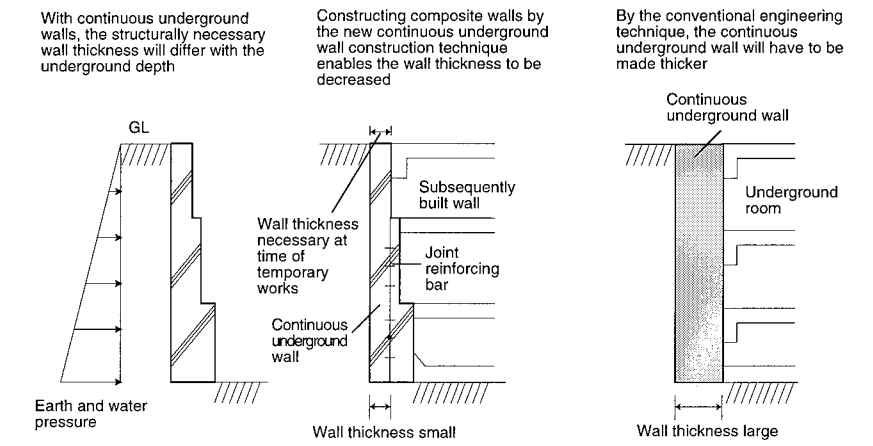
Technique for constructing bidirectional side-pressure resistant walls

To use continuous underground walls as bidirectional side-pressure resisting walls, the use of high-performance joints will be necessary



The applications of continuous underground walls will be expanded.
Also, high quality can be secured

Composite wall construction technique



Underground space can be utilized widely.
Construction costdown is possible.

a horizontal drum cutter type EMX excavator capable of constructing extra-deep, extra-thick diaphragm walls with a maximum wall thickness of 2.4 m and to maximum depth of 150 m.

Introduction of the new diaphragm wall construction technique will reduce foundation construction costs by over 30% compared with the construction of foundations of equivalent performance by the conventional method using piles.

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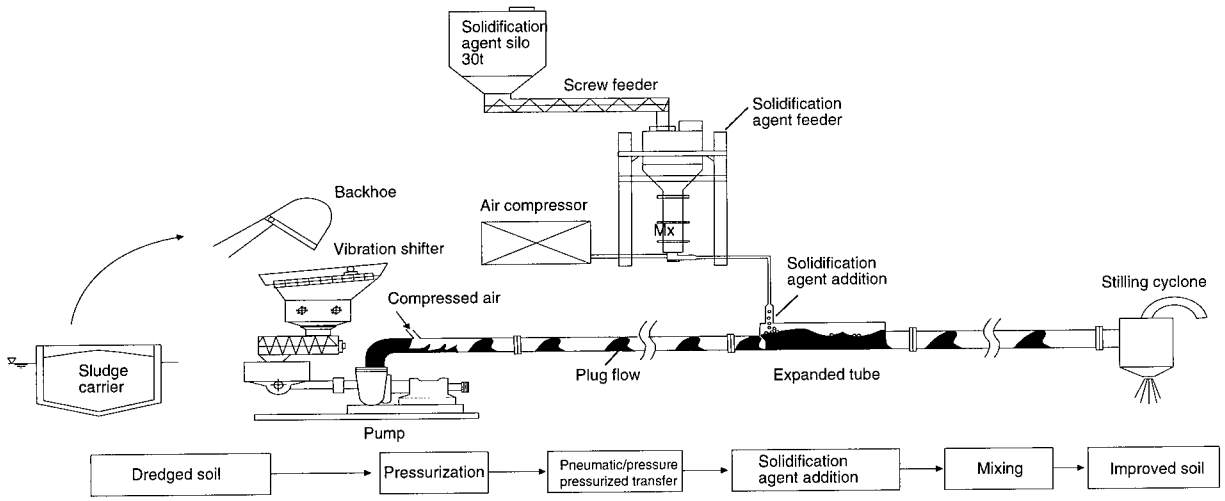
98-01-006-04
Engineering Technique to Utilize Dredged Soil as Filling Material

Toa Corp. has established an engineering technique named PLUG MAGIC Line Mixing Method that enables weak dredged soil to be solidified efficiently for reuse as a filling material. When discharging dredged soil by pneumatic/pressure-pump transfer, cement or some other solidification agent is admixed into the soil directly to enable the soil to be utilized as a filler material. In this case, the solidification agent is mixed inside the pneumatic/pressure-pump tube. This method requires no mixer, and the operating cost can be reduced by 10-15%.

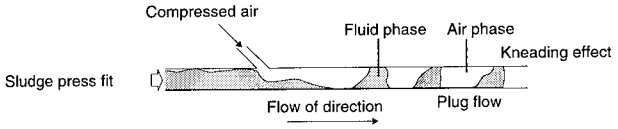
The weak dredged soil generated in the port and harbor facilities or waste treatment facilities is generally treated by mixing with a solidification agent and utilized as a filling material. With the conventional solidification treatment method, a mixer is indispensable, making a large-scale plant or the use of a soil solidification vessel necessary.

In general, when mixing compressed air into weak sludge, a phenomenon known as plug flow is generated, which is an air/fluid two-phase flow that causes a turbulent flow in the fluid phase and generates a sludge kneading effect. With the new dredging soil treatment method, an expanded tube with a larger sectional area than the pressure-feeding tube is used in the soil solidification agent admixing unit, by which the addition of the solidification agent into the fluid phase sector is smoothened substantially. Also, the sectional area



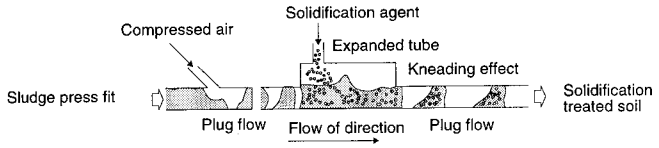
System schematic diagram

Principle of kneading

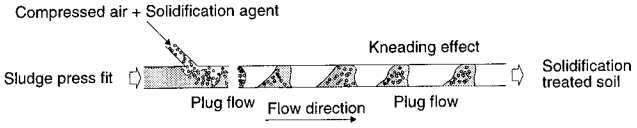


Solidification agent adding device

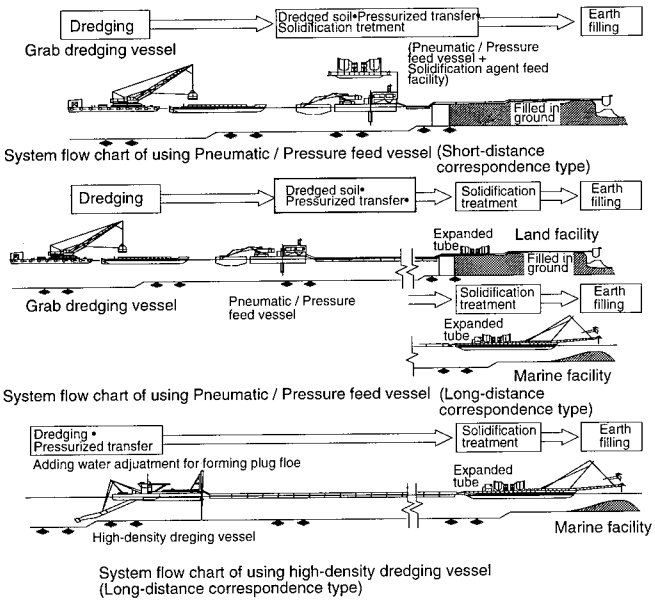
(1) Long-distance correspondence type



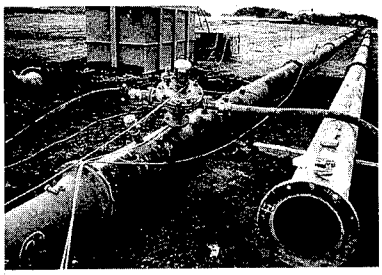
(2) Short-distance correspondence type



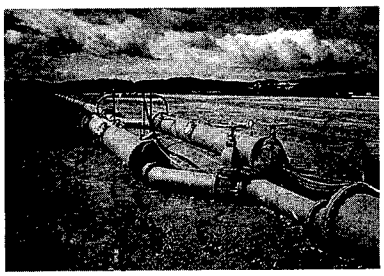
Principle of kneading and solidification agent addition facility



Concept of mixing solidification treatment in tube engineering method system



Short-distance correspondence type Solidification +air jet port



Long-distance correspondence type Expanding tube cement feed port

Stilling system Solidification treated soil jetting status

of the large expanded tube is made narrower subsequent to solidification agent addition, which automatically regenerates the plug flow and promotes mixed kneading. Incidentally, in the event of a short pressurized flow distance, the necessary kneading effect is obtained simply by adding the solidification agent into the compressed air.

The method of arranging a large expanded tube in the solidification agent admixing unit to perform solidification of weak soil is called the long-distance correspondence type and is used in the final stage of pressurized transfer of solidification agent admixture, by which the system is usable for working with a filling point that is over 200 m and up to about 3,000 m away (the generic pressurized transfer distance of a pneumatic/pressure-feed vessel). Meanwhile, the method of not using an expanded tube and using only an ordinary pressurized feed tube for compressed air and solidification agent admixture is called the short-distance correspondence type, and is employed when the distance between the weak soil dredging point and the filling point is within 200 m.

There is also the method using an existing pneumatic/pressure pump vessel at the pressure pump sector, installing a solidification treatment facility on land or on the sea, and the high-density dredging vessel, so various types of dredging units, pressure-pumping units and solidification treatment units can be used depending on the specific conditions at the worksite.

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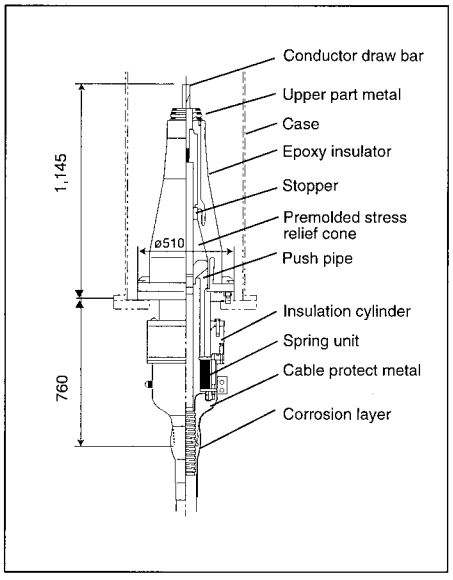
Energy & Resources

98-01-007-01

Prefabricated Type Sealing End for 275kV CV Cable

Hitachi Cable, Ltd. has commercialized a prefabricated type SF_6 gas immersed sealing end and oil immersed sealing end for 275 kV CV cables.

The conventional insulation system of the sealing ends for 275-kV CV cables is based on the oil-impregnation insulation system that has been used for the sealing ends of OF cables, so the insulating oil is sealed inside the sealing end. Therefore, an oil pressure compensation system had been necessary as an ancillary equipment, and in the assembling process, much time was consumed for oil sealing and for vacuum oil supplementation.



Structure of SF_6 gas immersed sealing end

The new prefabricated type termination sealing end adopts the prefabricated insulation construction that has already been commercialized for CV cables of up to 154-kV class. An insulation body is formed simply by fitting a premolded stress relief cone on the cable core at the worksite, followed by the mounting of an epoxy insulator. Therefore, there is no need for any insulating oil, making the use of an oil pressure compensation system unnecessary and enabling the sealing end to be installed in a small space.

Compared with the conventional type of oil-impregnation insulation system, there is no need for an oil sealing mechanism, so the structures of the sealing end are simplified substantially, and maintenance is easened considerably since the work of oil pressure monitoring is eliminated.

The new termination sealing end is designed in a standard model for application to electric conductors of up to 2,000 mm^2, but can also be applied to larger cables with sizes of 2,500-3,000 mm^2.

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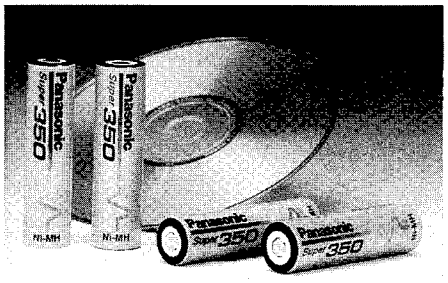
98-01-007-02

4,500 mAh Cylindrical Ni-MH Storage Battery

Matsushita Battery Industrial Co., Ltd. has achieved the industry's highest energy density and electric capacity levels with its new Ni-MH storage battery, exceeding those of the conventional rechargeable lithium ion battery. The new product has been developed in two models and named the Super 350 series. Production has started of the new battery model HHR450A, which features a storage capacity of 4,500 mAh and is interchangeable with conventional rechargeable lithium ion batteries. The new battery is cylindrical in shape, 18 mm in diameter and 67 mm in height.



Super 350

A new material which enhances conductivity has been adopted for the anode, and the development of a new production technique has made it possible to boost capacity. The composition of the electrolyte has been optimized to boost capacity and has further improved high temperature performance. The cathode has a thinner core and more active substances to boost electric capacity

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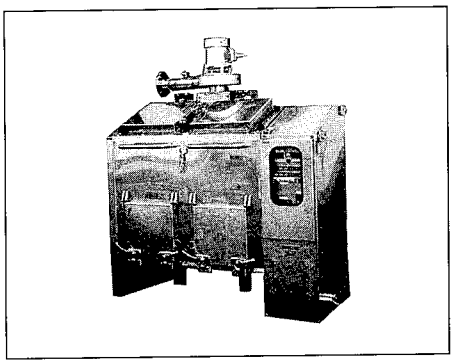
Environment

98-01-008-01
Raw Garbage Treatment System Applying Biotechnology

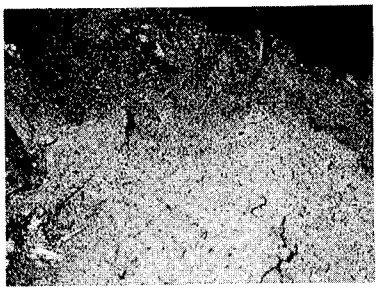
Nippon Kokan Koji Corp. has developed a raw garbage treatment system that utilizes the characteristics of biotechnology. The system has been demonstrated to display an excellent performance, so the company plans to venture into mass production.

The new raw garbage treatment system is available in two models featuring high-speed garbage decomposition and volume reduction by applying biotechnology (use of thermophilic aerobic bacteria), and characterized by compactness, lightness and noiseless operation.

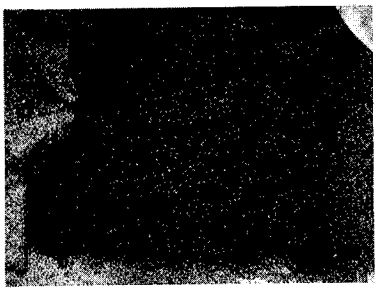


Raw garbage treatment system

Before treatment raw garbage



Treatment in the system



After treatment

Stainless steel is used as the main material to provide sanitation and corrosion resistance. The NN-S series systems are of the horizontal single-tank type designed to treat ordinary raw garbage in one day (24 hrs). These systems can be stopped over the weekend or worked empty for internal drying. The NN-W series systems are of the horizontal two-tank type designed for raw garbage which is rather difficult to treat, and ideal for operation around the clock or on holidays. Raw garbage can be dumped into the system alternately every other day, for treatment in two days (48 hrs).

Both these systems utilize many types of bacteria normally present in the soil, and convert the raw garbage into organic fertilizer which contain nitrogen phosphorus and potassium composites just prior to the final stage of decomposing the raw garbage into water and carbon dioxide gas. As a safety measure, they incorporate a stirring machine overload prevention system that stops system operation at overload, a system that automatically terminates the stirring motion whenever the lid is opened, and a power leakage alarm lamp.

* ***Nippon Kokan Koji Corporation***
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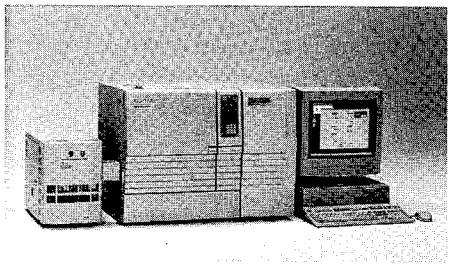
98-01-008-02
Continuous Automatic Monitoring and Measurement of Nine Types of Atmospheric Pollutants

Shimadzu Corp. has started marketing a system for the continuous automatic monitoring and measurement of nine types of atmospheric pollutants including cancer-causing pollutants. The system is also usable for monitoring substances such as chlorobenzene that is the precursor of dioxin. The system is marketed at a domestic price of ¥14 million.

The system is usable for monitoring and measuring nine volatile harmful substances which can be measured with the gas chromatographic mass analysis method, from among the 22 substances which are regarded as being the most harmful to human health. More specifically, the target gases are acrylonitrile, vinyl chloride monomer, chloroform, dichloromethane, 1,2-dichloroethane, tetrachloroethylene, trichloroethylene and 1,3-butadiene benzene.

The system consists of a cooling unit for concentrating the gaseous specimen and a gas analysis unit. In contrast to the conventional time-consuming system that has been used primarily previously of collecting atmospheric specimens with a canister and analyzing the specimen composition, the new system can collect the atmospheric specimen directly. Automatic and continuous analysis is possible at fixed intervals (minimum of 30 min), making the system a unique genuine atmospheric monitoring system not available previously. The system enables measurements of the changes in the volumes of harmful atmospheric pollutants with time, so is usable for evaluating the degrees of traffic pollution and for elucidating the states of atmospheric pollution in much greater detail than before.

When measuring atmospheric pollution, it is necessary to cool and concentrate the gas specimen, for which coolants such as liquefied nitrogen had been used previously. The new system introduces electronic cooling in place of this conventional method, by which the need for a coolant is eliminated. In addition, the drive mechanisms such as valves inside the system have been replaced with a motor from compressed air, so the running cost has



Continuous automatic monitoring and measurement of atmospheric pollutants

been reduced and the system made more compact as no liquefied nitrogen, high-pressure air container or compressor are required.

* ***Shimadzu Corporation***
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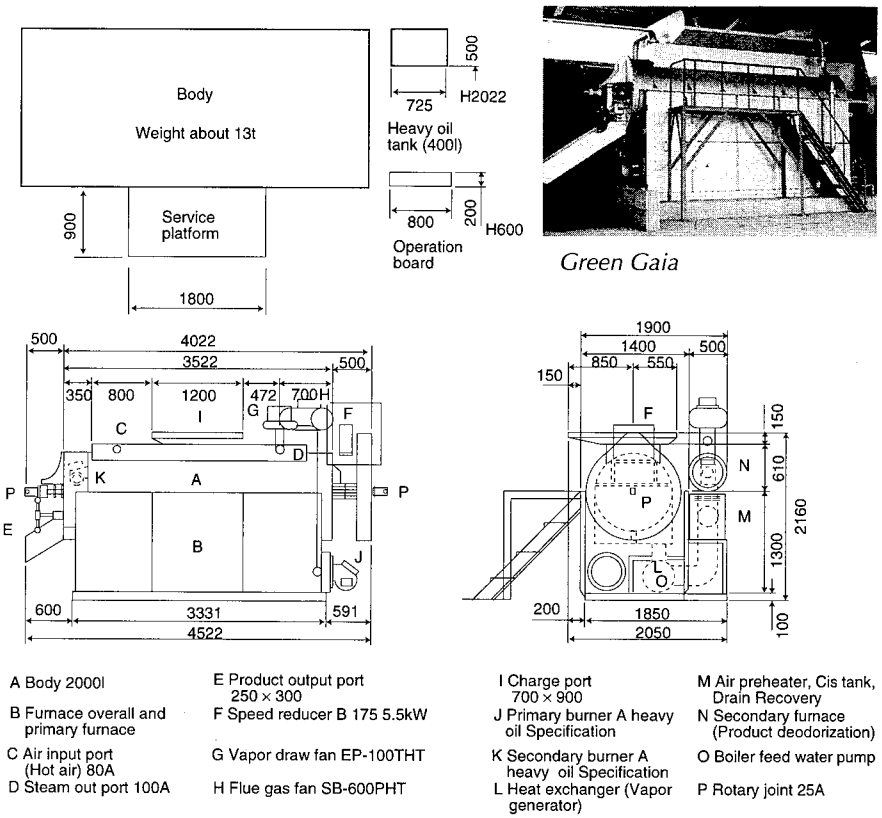
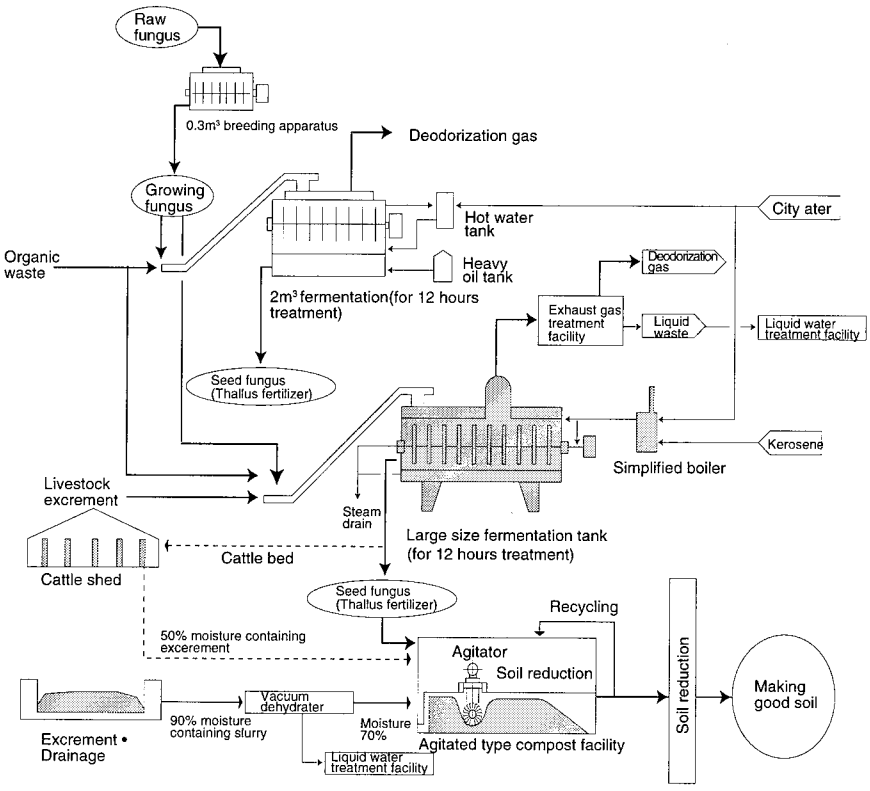
98-01-008-03 System for Converting Organic Industrial Wastes into Thallus Fertilizer

Kiyomoto Bio Co., Ltd. has identified several types of microorganisms (fermentation microorganisms) which can survive temperatures from 0°C to 150 °C, and have developed a system called Green Gaia that converts organic industrial waste into fungus biomass fertilizer by fermentation treatment as quickly as in half a day. The pathological bacteria in the fungus body fertilizer are killed off and the fertilizer odor removed at the same time.

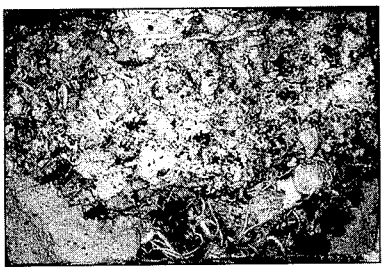
The system was commercialized through the coordinated efforts and support offered by Miyazaki Prefecture and Miyazaki University in a project to develop innovative environmental preservation technologies that was implemented by the Miyazaki Prefectural Industrial Club. The system consists of a fermentation furnace, a deodorization furnace, heat exchangers and two burners. It is being produced in two demonstration models, one with a daily capacity of treating 2,000 l of industrial wastes, and another with a capacity of 200 l (about 150 kg). These systems are usable for treating food processing wastes, fish processing remains, livestock excrement and raw garbage for reduction into fertilizer, and for treating waste edible oils sludge and shochu waste liquids.



Arrangement drawing

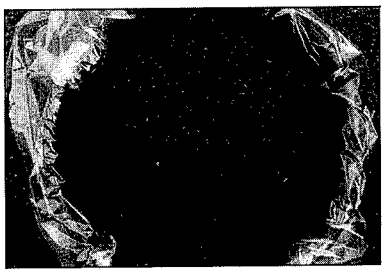


Green Gaia flow chart



Raw garbage material

Bony parts of fish material



After treatment

After treatment

The water content of the substance to be treated is adjusted to 40-45% with substances such as rice bran, then fed into a treatment tank. Fermentation bacteria are sprinkled into the tank and fermentation continued for 5-6 hrs at an initial temperature of about 60 °C. Subsequently, the temperature is raised to about 100 °C in the drying process to dry the fertilizer. Therefore, pathological bacteria, grass seeds and E. coli bacteria are killed off in the process.

The type of fermentation bacteria is changed depending on the substance to be treated. When generating the fungus biomass nitrogen is converted and fixed into amino acids, so the generation of offensive odors by nitrogen compounds is prevented. Phosphorus can also be converted into thallus in the form of amino acid, so it is possible to feed phosphoric acid to increase the saccharinity and to prolong the freshness.

When generating fungus biomass, a huge volume of thermal energy is generated, so a perspiration effect is displayed, by which moisture is evaporated intensively. The fungus biomass fertilizer supplies amino acid into the soil and serves as a reducing type fertilizer of high added value. An outstanding characteristic are the immediate and prolonged effects of the fungus biomass fertilizer. The fertilizer is also capable of coexisting with other microorganism groups proliferating in the soil and therefore displays multiple effects, so that it enables easy decomposition of lignin and fibrous substances. It also suppresses the proliferation of fusarium, nematode and sclerotium microorganisms which generate root disorders.

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98-01-008-04

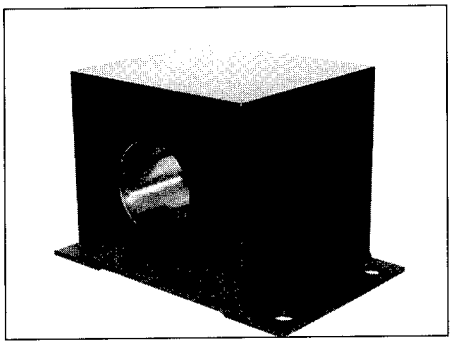
System Using Magnetism to Coagulate and Precipitate Impurities in Faucet Water

Morioki Industrial Co., Ltd., has developed a Magnetic Coagulation/Precipitation System that coagulates and precipitates impurities in faucet water by magnetic force. The system will be marketed at a domestic price of about ¥1,400,000.

The faucet water tube is passed through the midpart of a box containing permanent magnets which generate a ferromagnetic field of 3,000-5,000 G. The system is apply for vinyl chloride pipes and nonmagnetic pipes. The magnetism generated by the permanent magnets coagulates the impurities adhering inside faucets or in the faucet water, and precipitates these foreign substances into a sump tank.

Foreign substances in faucet water consist mainly of ferrous substances which react to magnetism, so the system is designed to attract these magnetic foreign substances. The passage of magnetism through the water also minimizes water clusters and improves the sterilization effect.

The system weighs about 13 kg and can withstand heat of up to 150 °C. The working calibre is 40-50 mm, and the magnet box is covered with a material made of a special type of metal to prevent magnetic leakage. The system can be fixed easily and snugly on walls with screws, there is no need for any electricity, and the system is usable semi-permanently without incurring any running cost. Maintenance is accomplished with ease, simply by shifting a gadget provided on the rearside of the water discharge port by about 200 mm, cleaning the system, then releasing the gadget after cleaning is completed.



Magnetic coagulation/precipitation system

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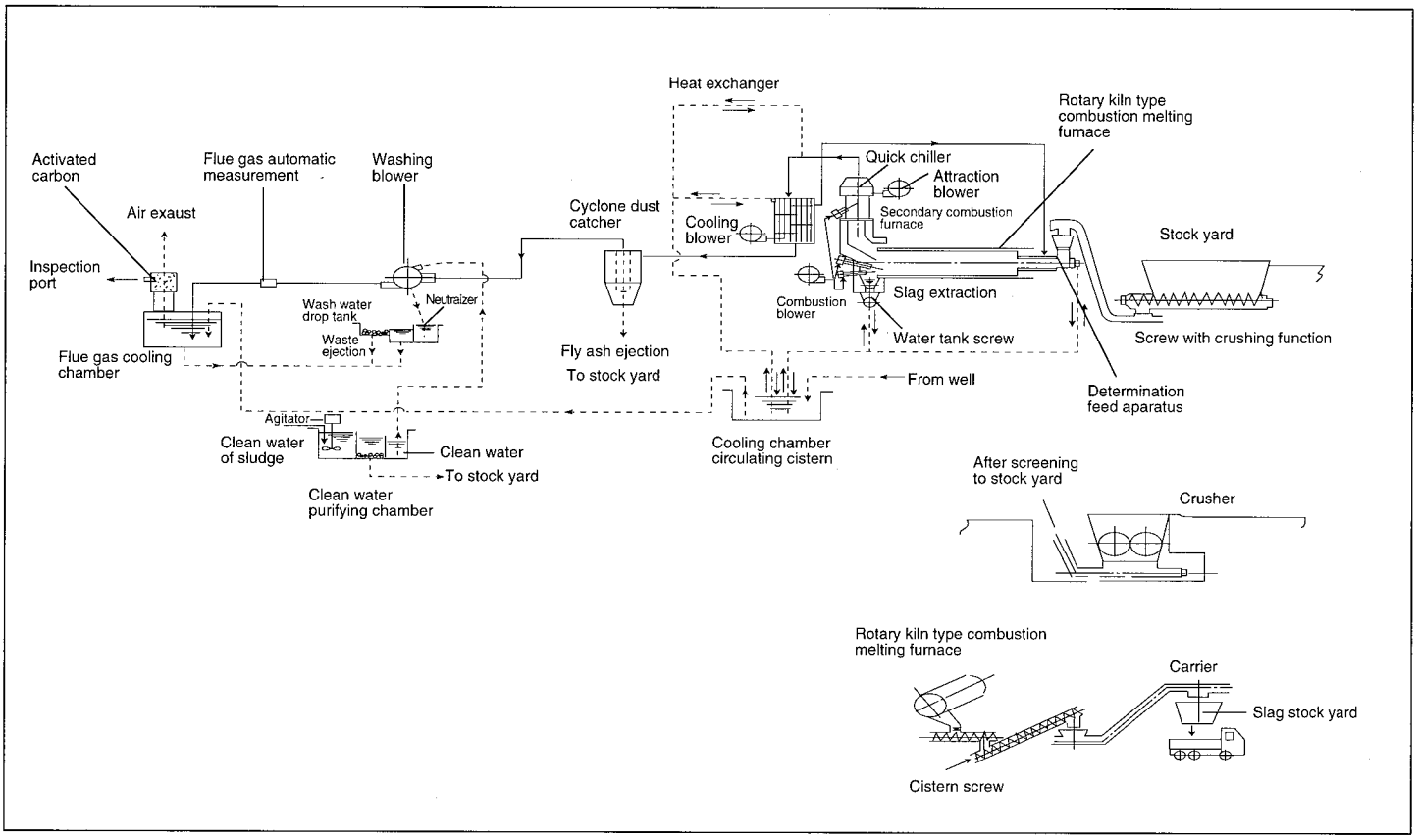
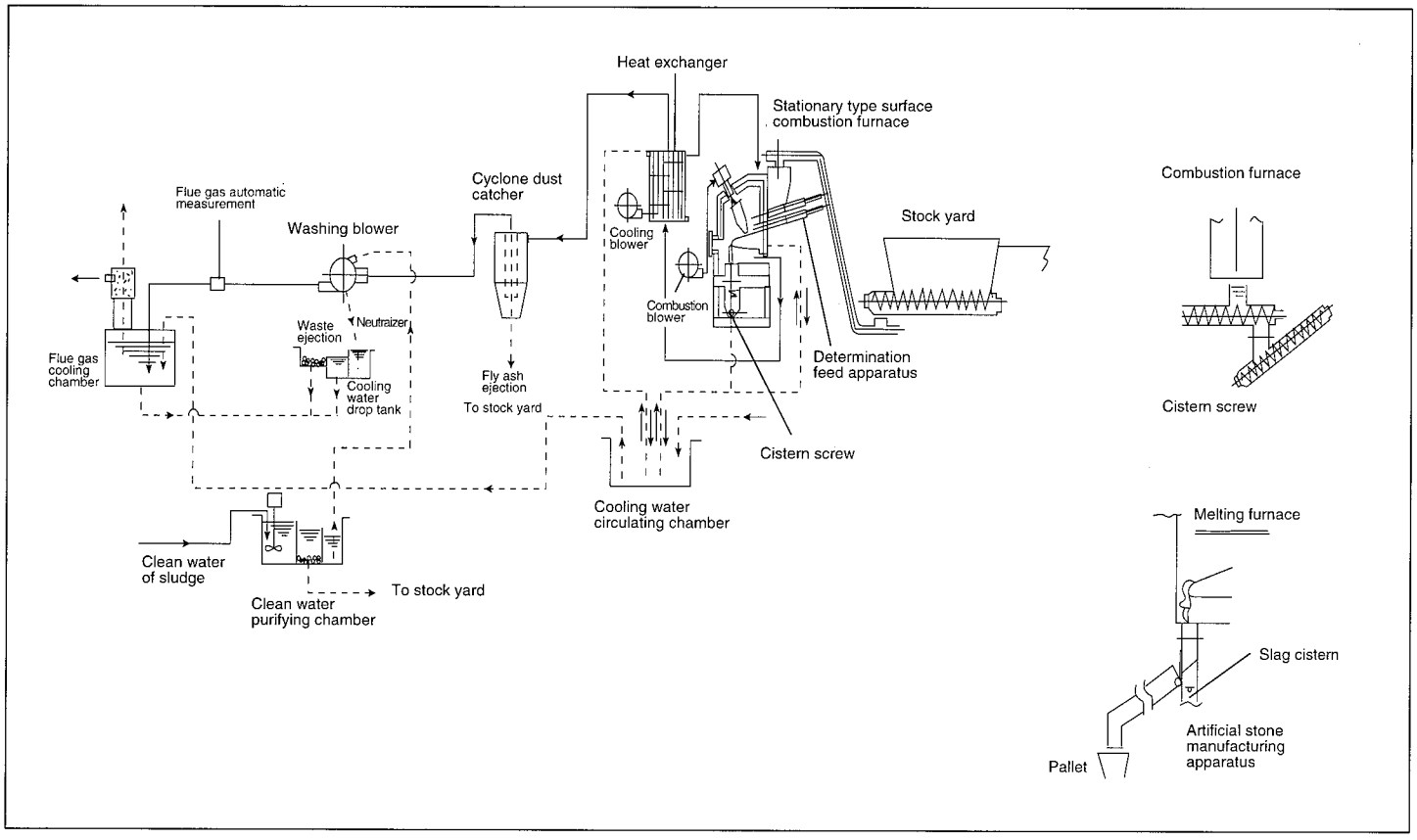
98-01-008-05

Technique to Recycle Molten Slag as Useful Resources Without Generating Dioxin

Jet Co., Ltd. has established a technique to prevent the generation of dioxin and to recycle molten slag as useful construction structural members. The technique is applied to existing incineration furnaces, and the waste incineration ash and smoke is fed into a melting furnace for melting and solidification at a maximum temperature of 1,600 °C. The capital cost of a rotary melting facility with a processing capacity of 6 t/day is about ¥50 million.



Rotary kiln type combustion melting flow sheet



Stationary type combustion melting furnace flow sheet

The JK Ultrahigh-Temperature Fusion System is available as a rotary type melting furnace and a rotary type combustion furnace equipped with a stationary type fusion furnace. Both these systems are for working with general industrial waste incineration ash, and enable the dioxin issue to be resolved while utilizing existing incineration furnaces intact. The slag is usable as a road foundation material or as a concrete ingredient.

The rotary type melting furnace has a daily treatment capacity from 6 t to a maximum 75 t, features a high melting capacity and an extremely low construction cost, and allow to construction in a small area. The melting temperature is 1,400-1,600 °C.

With the rotary type combustion furnace/stationary type melting system, the incineration ash receives primary treatment with the combustion furnace (screw kiln), and the combustion ash of reduced volume is converted into slag in the melting furnace. The introduction of the primary treatment process enables a wide range of target substances to be melted, the melting furnace is also downsized, and the capital investment cost is reduced from one-fourth to one-sixth compared with that of conventional types of newly constructed plants.

The combustion temperature of the rotary type incineration furnace is 800-1,200 °C, while that of the stationary type melting furnace is 1,400-1,600 °C, and both these furnaces can use Class A heavy oil as an optional fuel, as well as waste oils, kerosene and waste tires.

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98-1-008-06

Prevention of Dioxin Formation from Incineration Furnaces Made of Quartzite

Natsume Industry Co., Ltd. has established a technique to prevent the generation of dioxin from incineration furnaces using quartzite of significant catalytic effect. A filler layer packed with numerous fillers consisting of quartzite is packed between the secondary combustion domain and the secondary combustion gas outlet domain to neutralize the combustion gas, so this technique can be applied to existing incineration furnaces by easy modification.

In order to remove hydrogen chloride gas that is the source of dioxin, the most widely adopted method is to cool the waste combustion gas to the temperature of 150-250 °C, then jetting slaked lime into the gas for neutralization. However, the removal of hydrogen chloride gas with slaked lime occurs only up to about 200 °C, and dioxins already generated at a high temperature level of 350-400 °C. The hydrogen chloride level in the exhaust gas in the process of cooling is believed to have a great influence on the generation of dioxin.

The research team established a technique to install a filler layer consisting of quartzite that has a heat resistance of 1,600 °C in the secondary combustion furnace, and the combustion gas is passed through the secondary combustion furnace maintained at a temperature level of 800 °C to collect hydrogen chloride and to prevent the generation of dioxin. A filler layer weighing about 5 t is used by an incineration furnace with a daily capacity of 500 kg/day. It is usable for about one year, and a repacking layer is sold at a price of ¥200,000/t.

Quartzite is mined in the Oku Mikawa region of Aichi Prefecture and is estimated to have been generated at a high atmospheric pressure of 10,000 Pa and ultrahigh temperature due to a massive crustal movement that was caused by the collision of two marine plates about 20 million years ago. Analysts estimate that quartzite consists of about 80-90 wt% SiO_2 and 8-9 wt% Al_2O_3. It is obtained as a hard porous stone in grayish white color and, according to X-ray analysis, its mineral composition consists of quartz, soda feldspar, potassium feldspar and a small volume of mica.

The Chemical Products Inspection Association used about 10% of the volume of the quartzite used in an actual incineration furnace to assess the substance performance when used in the combustion of wastes containing 40% of chlorine-based substances. It was confirmed that 93.3% of hydrogen chloride and 67.4% of dioxin was removed. These results corroborated that the filler layer satisfy domestic omission standards, so the research team plans to commercialize the filler layer as soon as possible.

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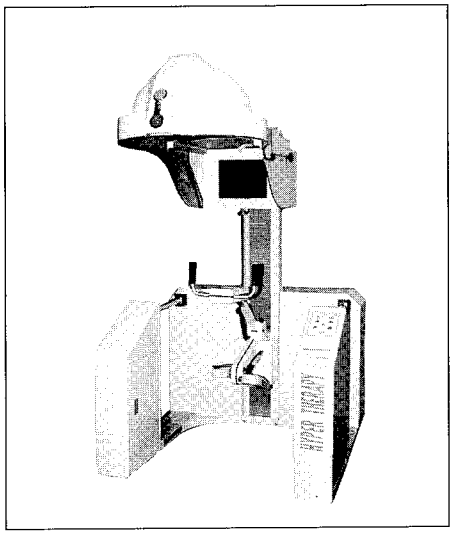
Biotechnology & Medical Science

98-1-009-01

Computerized Rehabilitation Training System

France Bed Medical Service Co., Ltd. Nippon Rehabilitate Co., Ltd. and Mikuni Co., Ltd. have jointly developed and started marketing a rehabilitation training system Hyper Therapy that incorporates a computer system and an image processing system. The domestic selling price is ¥19,800,000.

Hyper Therapy has been developed as a rehabilitation training system that is usable widely for the rehabilitation of ordinary patients to the rehabilitation of advanced mental patients. Individual patient data as well as training menu data can be recorded in the optical card.



Hyper Therapy

In addition, the system features other distinct advantages. For example, the patient can engage in rehabilitation while changing the rotary forces and speeds of the training equipment and while acquiring physical sensations with a vibrator by utilizing the computer three-dimensional images and voice-aided visual and audio senses, the patient can change the attachments to widen the range of movements of the upper and lower limb joints as well as to train muscles, the patient can receive training continuously with a sense of pleasure and enthusiasm by acquiring a sense of attainment through participation in various events and while observing the display of distance and quantities through three-dimensional imaging, and the patient can draft an individual training menu in conformance with the physical problems and/or recovery since it is possible to change the automatic motions, transitive motions, rotary force, rotary speed/time as well as the colors, sizes, shift speeds, numbers and arrangements of the images by external input.

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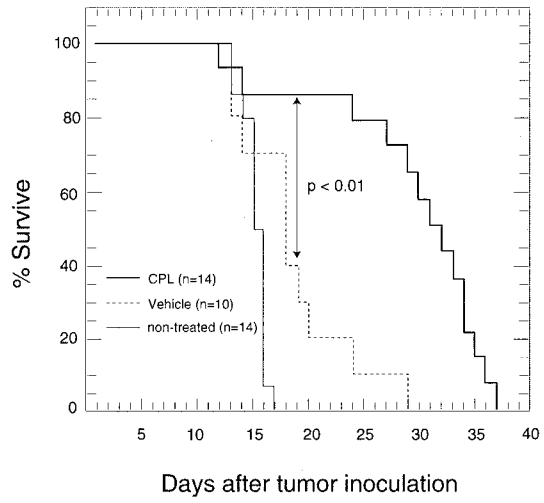
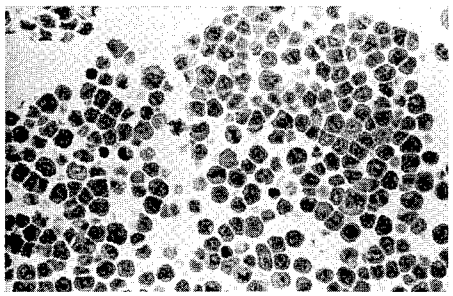
98-01-009-02
Cyclic Polylactates Discovered to Manifest Anticancer Effect

Y. Nagato and S. Takada and their research team of the Faculty of Medical Science, Tokai University, have discovered that cyclic polylactate (CPL), a new substance that polymerizes lactic acid molecules in cyclic form, manifests an anticancer effect. The substance blocks the metabolic function necessary for cancer cell proliferation. In addition, the side effect is extremely low compared with conventional types of anticancer agents.

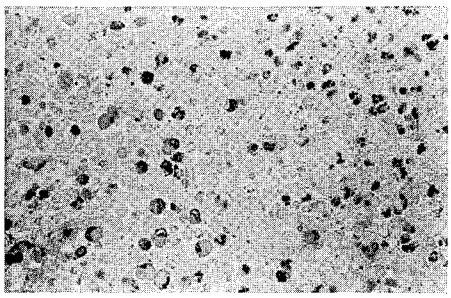
CPL blocks the activities of enzymes which create the energy necessary for cancer cell proliferation. CPL blocks the activities of lactic acid dehydrogenation enzyme as well as pyruvic acid kinase, a type of the anaerobic glycolytic key enzyme, so that the activities of anaerobic glycolytic systems are reduced. This slows the formation of nuclear membranes and cell membranes, eventually resulting in the destruction of cancer cells.



CPL effect on surrival of mice with cancer



Colored spherical floc of tumor cells 12 days after implantation of cancer cells



Cell nuclei are almost all not colored Tumor cells are damaged 12 days after implantation of cancer cells and feeding CPL every other day

In experiments injecting CPL into mice implanted with cancer cells, the injection was confirmed to suppress cancer cell proliferation and to prolong the lives of mice with cancer. In addition, no side effect symptoms were observed, such as loss of weight or hair.

CPL is a substance discovered by Tokai University researchers from the waste culturing liquid used for culturing cancer cells. The lactic acid polymer is a cyclic polymerization structure that was unknown in the past, and it was also successfully synthesized artificially.

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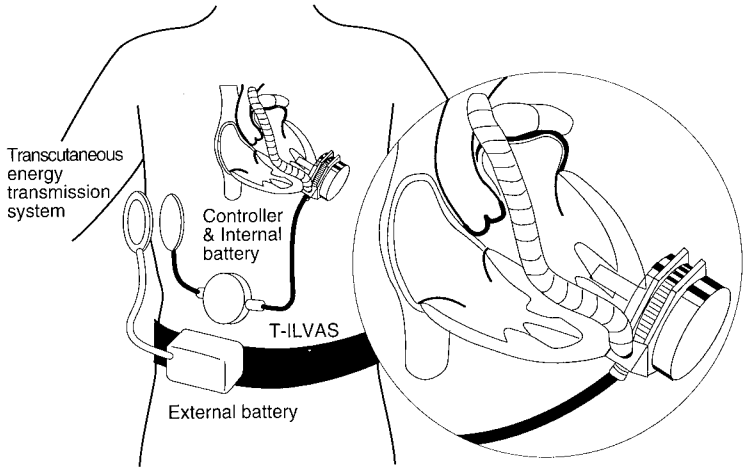
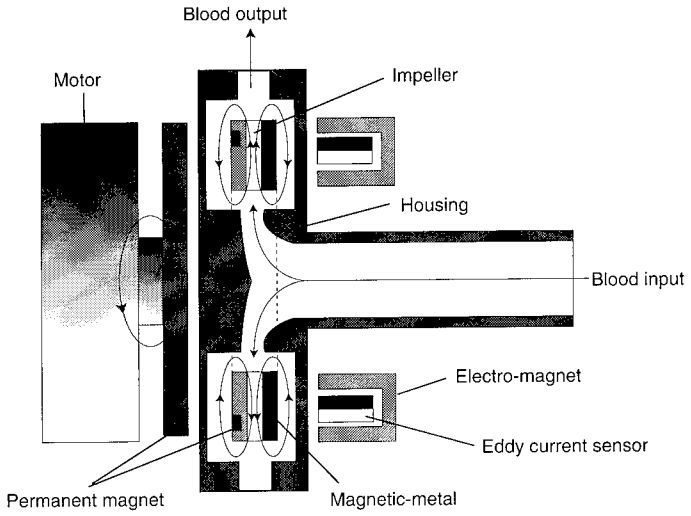
98-01-009-03
Implantable Left Ventricular Assist System

A joint research team consisting of Prof. T. Akamatsu of the Faculty of Mechanical Engineering, Setsunan University, Terumo Corp. and NTN Corp. has developed a compact, high-performance implantable left ventricular assist system.

The left ventricle of the human heart pumps blood throughout the body so has dominant role than the right ventricle that pumps blood to the lung. Many patients suffering from severe heart failure can survive simply with left ventricular assist, so the research team ventured to develop a left ventricular assist system. Using only the left ventricular assist system, it will be possible to leave the heart inside the living body, which reduces body invasion, the heart pulsation can be maintained, and there is also the advantage that the heart functions may recover.



Termo Implantable Left Ventricular Assist System



Magnetically suspended impeller (MSCP)

The system constituents are a centrifugal pump with a magnetically suspended impeller (MSCP) to pump the blood, a controller to drive and control the pump, an internal battery, a transcutaneous energy transmission system to supply electric energy to the controller and the internal battery, and an external battery.

The MSCP pumps blood out with the centrifugal force generated by revolving an impeller installed inside the pump housing. The pump adopts the non-contact mechanism of floating the impeller with magnetic force (magnetic bearing) and revolving by a magnetic coupling with the motor, so there is no rotary shaft or shaft seal like ordinary centrifugal pumps. Therefore, the MSCP can provide years of long-term durability and non-thrombogenicity. The turbo pump for pumping blood with centrifugal force, as compared with the volume displacement pump, or pulsatile pump, is much more compact and lightweight.

The prototype MSCP has a diameter of 82 mm, thickness of 51 mm, weighs 400 g, and pumps blood to all parts of the body from the left ventricle. The basic experiments were conducted using a sheep extracorporeal left ventricular assist model, which achieved smooth operation like an actual heart for a maximum of more than 640 days. The system entered intrathoracic implantation using a sheep model in November 1997 and the experiment has been ongoing for more than 30 days. Terumo has announced that the system is usable at lower cost than conducting a heart transplantation.

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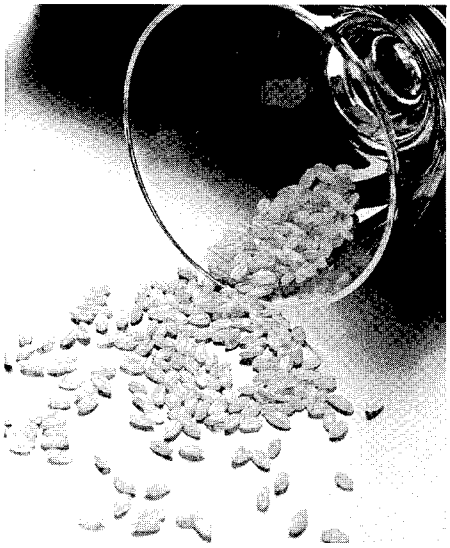
98-01-009-04

Cosmetic Raw Material Extracted from Beni-Koji (Red Malted Rice) Used for Age-Retarding Chinese Medicine

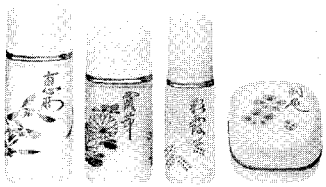
Oppen Cosmetics Co., Ltd. and Gunze Ltd. have jointly established a process to extract a cosmetic raw material unavailable previously from Beni-Koji that is used to produce Chinese medicine to retard ageing, and Oppen Cosmetic has started marketing a skin care cosmetic that utilizes the characteristics of the raw material to activate the deep tissues of the skin. By devising the culturing conditions appropriately and using enzymes for the raw material decomposition, an effective fluid component was extracted that promotes cell proliferation.

Beni-Koji is known to proliferate mold fungi belonging to the monascus species, and the effects to retard ageing and to lower high blood pressures are recogniżed. Gunze commercialized a health food ingredient that is added to vinegar and miso (bean paste) in 1984.

The two companies jointly developed the cosmetic raw material by establishing a technique to produce Beni-Koji AP50 to permit Beni-Koji to be applied to the manufacture of the new cosmetic raw material. Steamed rice implanted with Beni-Koji fungi was cultured for six days at 30 °C. Subsequent to heating and cooling, a diastatic enzyme and a protein decomposition enzyme were added and the fluid then filtered, by which a substance effective for producing an anti-wrinkle cosmetic raw material was extracted. This is the first time



Beni-Koji



Tae

in which Beni-Koji itself has been used as the raw material for producing an anti-wrinkle cosmetic raw material.

The extract has been confirmed to display a fine wrinkle removal effect through moisture retention as well as a large wrinkle removal effect through fibroblast cell activation. Adding 10% of the extract to a cosmetic base and applying the cosmetic material promotes the ordinary fibroblast cell activation effect of generating collagen that promotes proliferation rate by 1.4 times, thereby recovering the loss in tension and elasticity of the skin.

Oppen Cosmetics has acquired new cosmetic product recognition from the Ministry of Health and Welfare, and has developed four types of the skin care cosmetic product Tae for use as a cosmetics blending raw material.

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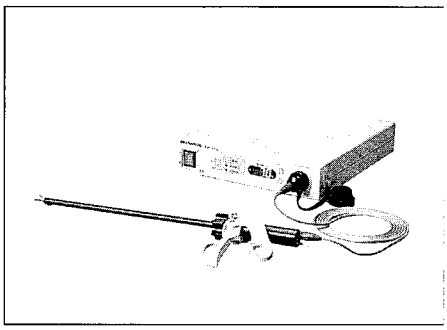
98-01-009-05

High-Performance Ultrasonic Scalpel

Olympus Optical Co., Ltd. has developed and started marketing an ultrasonic scalpel called SonoSurg that uses ultrasonic waves as its energy source to enable efficient surgery. Energy treatment equipment is widely used in surgery, such as the electric scalpel that enables bleeding to be stopped with ease compared with the conventional scalpel. The electric scalpels in use today have the problem of a portion of the tissues being carbonized by the heat. With the ultrasonic wave scalpel, the proteins of the peripheral tissues are agglutinized and the blood flow stopped simultaneously with surgery, so excessive bleeding is prevented and there is also no hazard of carbonization.

The new ultrasonic scalpel uses an ultrasonic wave of 23.5 kHz frequency. The electric energy generated by a generator is converted into ultrasonic oscillations with a transducer, then transmitted to the probe to generate oscillations. The frictional heat generated by the oscillations of the blade at the probe tip agglutinizes tissues and enables internal organs to be removed by the blade mechanical oscillations. When the target internal organ is nipped with the tip part formed like a pair of scissors, the ultrasonic wave oscillations are transmitted for the surgical operation, while at the same time denaturing the tissue proteins and converting them into a viscous substance. This viscous substance stops peripheral bleeding, so there is hardly any bleeding when conducting surgical operations. The disuse of clips to stop bleeding lowers medical costs, also shortens the surgery time and alleviates the burden on surgeons.



SonoSurg

Blood vessels with diameters of up to 5 mm can be treated, so the new ultrasonic scalpel is applicable to extracting uterus, kidneys and spleens with comparatively numerous capillary blood vessels, as well as for the exfoliation of internal organs of intense fusion. The scalpel is also applicable to surgical endoscopes which perform surgical operations through small holes opened in the abdomen.

The scalpel consists of a foot switch that is used to adjust the ultrasonic wave output with the foot, a SonoSurg Generator for generating ultrasonic waves, an oscillator for generating oscillations, and a scalpel scissors probe. The output can be set in ten stages of intensities.

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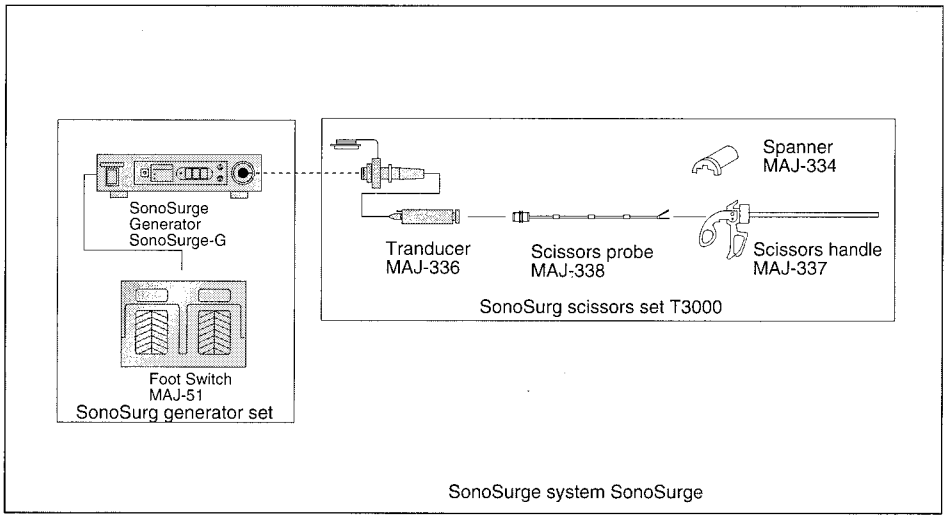


System chart

FLASH

Steaming Bag for Heating with Hot Water

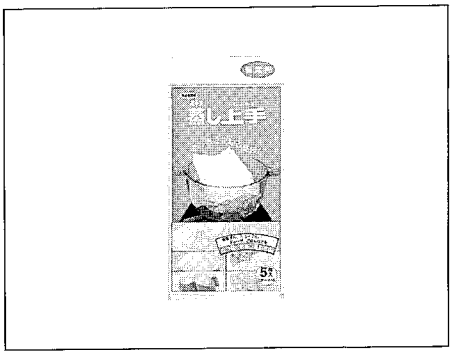
NEXTA Corp. has started marketing a newly developed outdoor steaming ag Mushi Jozu (Clever Steamer) that enbles foods to be placed inside a bag for oiling with hot water to enable simple ooking. The steaming bag was commerialized based on an idea suggested by a emale worker in response to the ompany's request for innovative new roduct ideas.

Foods such as Chinese manju (bun with ean-jam filling), shu-mai (steamed dough /ith meat filling) and steamed gyoza dumpling stuffed with minced pork) are laced in a bag of unique construction, then nese foods together with their bag are eated for 5-20 min simply in hot water /ithout filling any water in the bag.

The bag is made of strong paper featuring special filtration and anti-bacterial effects. It has a low combustion calorific value when incinerated, and does not generate any harmful gas or residue. The bag is usable with a hot water boiling system, a cage steamer, a steaming system for steam jetting, an electronic range, Joule heating system and other existing heating systems.

The bag is used in direct contact with water, so few problems are caused by improper heat adjustment mistakes such as overheating, and is usable by anyone since it requires no special skill. The food is not placed on a straw netting (hurdleboard) above the water as when using a cage steamer, so there is no chance of the food being overheated and desiccated by saturated steam, nor of the foods becoming dewed when cooled. In addition, since the foods are not influenced by drainage or excessively dried vapor, there is no heating or drying disparity.

A set of five bags each measuring 14 × 12 × 27 cm is sold at ¥330.



Mushi Jozu (Clever Steamer)

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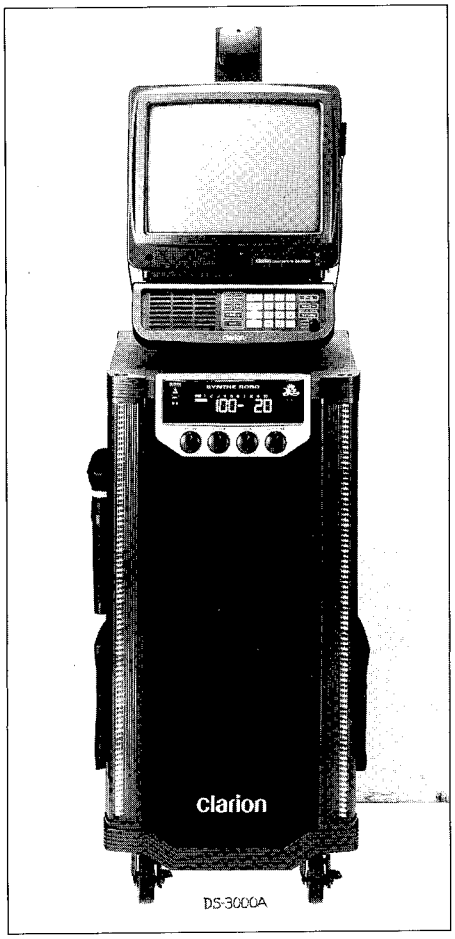
Compact, Lightweight and Easily Movable Karaoke System for Hotels and Party Rooms

CLARION Software Co., Ltd. has started marketing a newly developed ompact, lightweight and easily movable araoke system Synth Robot that is availble in two models and which can accommodate up to a maximum of 40,000 songs or use in entertainment.

The system consists of a karaoke system, a high-power amplifier with an output of 70 W and a large-calibre speaker of 30-cm diameter. The songs are stored in a ard disk. The standard type for 2,560 ongs is marketed at a domestic price of 920,000, and a type for 5,437 items at a rice of ¥1,160,000. New songs are supplied with floppy disks, each capable of ccommodating 30 songs. A full-color still icture is used as the background of the yrics screen, but a background video system is available for video CD.

The system fully incorporates all functions necessary for a commercial karaoke system, such as an original musical interval function that serves as the standard for independent key and tempo adjustment, a melody changing function that enables selection of professional, amateur and normal modes, and a harmolina function (sold separately) that enables an individual to duet. It also incorporates a Kya-Kya Remote Controller that is recorded with various vocal tunes from Kanpai Ondo to Sanbon Shime, also a Bingo Game that advances the bingo game by voice, a record slow- and fast-turn tune-guessing game as well as a new function called Intro Quiz, all of which are designed to provide game functions for entertainment.



Synth Robot

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JETRO

Japan External Trade Organization

Machinery and Technology Department